

NELSON'S ENCYCLOPÆDIA

VOL. XXIII.

V — Zymotic

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LONDON, EDINBURGH, DUBLIN, LEEDS

PARIS, LEIPZIG, AND NEW YORK

LIST OF CONTRACTIONS USED IN THIS WORK.

ac., acres.
agric., agricultural.
alt., altitude.
anc., ancient.
ann., annual.
Ar., Arabic.
Aram., Aramaic.
arr., arrondissement.
A.S., Anglo-Saxon.
aver., average.
bor., borough.
bur., burgh.
c. (circa), about.
cap., capital.
cf., compare.
co., county.
Com., Commission.
comm., commune.
cub. ft., cubic feet.
Dan., Danish.
dep., department.
dist., district.
div., division.
Du., Dutch.
E., east.
eccles., ecclesiastical.
ed., edition; edited.
e.g., for example.
Eng., English.
episc., episcopal.
est., estimated.
et seq., and following.
F., Fahrenheit.
fort. tn., fortified town.
Fr., French.
ft., feet.
Ger., German.
gov., government.

Gr., Greek.
Heb., Hebrew.
I., isl., island.
ibid., the same.
i.e. that is.
in., inches.
Ital., Italian.
Lat., Latin.
lat., latitude.
l. bk., left bank.
lit., literally.
long., longitude.
m., miles.
mrkt. tn., market-town.
Mt., mts., mount, mountain, -s.
munic., municipal.
N., north.
N.T., New Testament.
O.T., Old Testament.
par., parish.
parl., parliamentary.
Per., Persian.
pop., population.
Port., Portuguese.
prov., province.
q.v., which see.
R., riv., river.
r. bk., right bank.
R.V., Revised Version.
ry., railway.
ry. jn., railway junction.
S., south.
Sans., Sanskrit.
seapt., seaport.
Sp., Spanish.
sp. gr., specific gravity.
sq. m., square miles.

stn., station.
s.v., under the word.
Syr., Syriac.
temp., temperature.
terr., territory.
trans., translated.
trib., tributary.
U.S.A., United States of America.
vil., village.
vol., volume.
W., west.
wat.-pl., watering-place.
yds., yards.

Railways—C.R., Caledonian Railway;
C.P.R., Canadian Pacific Railway; G.E.R., Great Eastern Railway;
G. & S.W.R., Glasgow and South-Western Railway;
L. & N.W.R., London and North-Western Railway;
N.B.R., North British Railway, etc., etc.

Bibliography—Biog. Dict., Biographical Dictionary; Encyc. Brit., Encyclopædia Britannica; Proc. Royal Geog. Soc., Proceedings of the Royal Geographical Society; Jour., Journal; Hist., History; Mag., Magazine, etc., etc.

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V

V. Until the 16th century, V and U were two forms of the same letter. They are now distinguished, and each has taken part of the duty performed by the undivided letter. U, for the most part, is restricted to the representation of vowels, and V is employed with a consonantal value; W also shares in the division. V in English and French is voiced *f*—i.e. the voiced lip teeth spirant. In German it has the value of *f* itself. The sound *v* is not liable to much variation. Regarding the form, see U.

V., *versus* = against; *vide* = see.

V.A., Order of Victoria and Albert.

Vaal, riv., S. Africa, rises in Drakensberg Mts., s.e. of the Transvaal prov., and after being joined by the Klip flows w. and s.w. between the Transvaal and the Orange Free State provs. towards Platberg, whence it continues through Griqualand West to join the Orange R., in 29° 3' s. and 23° 37' E., after a course of over 700 m. Chief tributaries—Klip, Wilge, Valsch, Zand, and Modder on the left, and Harts on the right.

Vaalpens, a Negrito race of cave-dwelling cannibals, inhabit-

ing N. Transvaal and Bechuanaland, in which latter territory they live in a state of serfdom to the Baralongs. The Vaalpens are even lower in the scale of humanity than their kinsfolk the Bushmen.

Vaals, vil., Netherlands, in Limburg, 16 m. E.S.E. of Maestricht; has textile industries. Pop. (1910) 7,514.

Vac, or VACH, in the *Rig-Veda*, the personification of speech; in later literature identified with Sarasvati.

Vaccination, the operation for the prevention of smallpox, or the ensuring of it in only a mild form. It was first advocated by Jenner, who, in 1798, announced his discovery that those who by accident had become infected with cowpox—a disease whose relation to smallpox is not yet absolutely ascertained—became practically immune to smallpox. Vaccination is now performed with lymph taken from the eight-day vesicles produced by previous vaccination of a child or of a calf. Lymph from a child is called 'humanized' lymph. The lymph may be collected on bone or ivory points, and preserved by drying; or it may be taken up into thin glass

tubes (capillary tubes), which are then hermetically sealed to exclude air. Often glycerin is mixed with the lymph, to aid its preservation. Vaccine is introduced into the system by pricking or scarifying the skin, usually of the arm—lymph having previously been blown from a capillary tube on to the place or places to be scarified. About the eighth day the vesicle is of full size, and two or three days later the redness about the mark begins to fade, a scab forms and drops off, leaving a new skin beneath in about three weeks from vaccination. It is now generally held that for permanent safety it is probable that a child vaccinated within six months of birth should be revaccinated some fifteen years later, and again any time after an interval of ten years should smallpox be prevalent. The great argument brought against vaccination is the danger of transmitting other disease, and particularly syphilis, with the lymph. That syphilis may be, and occasionally has been, transmitted in this way is true; but this merely shows the necessity of choosing absolutely healthy children from whom to take lymph. Better still, it is in favour of vaccinating with glycerinated calf-lymph, which is equally protective, and is secure from conveying syphilis. Analogous to vaccination is the protection afforded in other contagious diseases—*e.g.* diphtheria and typhoid fever—by the inoculation of serums (see SERUM), and in tuberculosis by the intestinal absorption of tubercle bacilli modified by heat. See VACCINE THERAPY.

Vaccination Acts. In 1851 vaccination was made compulsory. The statutes regulating the subject are the Vaccination Acts, 1867 to 1898. Under the Act of 1867 it is the duty of the guardians to

appoint vaccination officers to enforce the act, and to enter into a contract with a qualified medical practitioner to vaccinate children gratuitously, and, if required, at the child's home, and to give certificates. Persons having the custody of a child are required to have it vaccinated within six months of birth; by the Act of 1898, which does not extend to Scotland or Ireland, if they satisfy a petty sessional court within four months of birth that they conscientiously believe that vaccination would be prejudicial to the child's health, they are to receive certificates exempting them from penalties. This act also abolished repeated penalties. Many boards of guardians have, in consequence of an anti-vaccination propaganda, neglected the statutory duties imposed upon them; but the Local Government Board can obtain a mandamus from the High Court to compel their obedience. Vaccination in Scotland is governed by the Vaccination (Scotland) Act, 1863, and is carried out by the parish council. Vaccination must be carried out within six months, under a penalty of one pound or ten days' imprisonment. Vaccination in Ireland is governed by the Vaccination (Ireland) Acts, 1857, 1863, 1868, and 1879. In Ireland a child must be vaccinated within three months of birth. Revaccination is not compulsory anywhere in the United Kingdom, but it is compulsory in France, Germany, Italy, and Japan, and recent statistics have proved its value.

Vaccine Therapy. According to Sir Almroth Wright treatment by vaccines has progressed so far in the past few years as to justify the belief that the medical practitioner of the future will be largely a vaccinator. Vaccine therapy must not be confused with serum therapy. A vaccine is a chemical substance which,

when introduced into the organism, causes there an elaboration of protective substances; a bacterial vaccine is, therefore, a chemical substance derived from bacteria. Investigation of the changes in the blood serum after inoculation with a bacterial vaccine or during the period of a specific infection has revealed the presence of a definite series of protective substances, which are named according to their physiological properties. Thus we have *agglutinins*, which clump the particular bacteria as in typhoid and Malta fevers; *precipitins*, which precipitate microorganisms in emulsions; *antitoxins*, which neutralize the toxins poured into the system as a result of a localized bacterial infection as in tetanus and diphtheria; *lysins*, which promote a solution and destruction of the bacteria, and in certain conditions the red blood corpuscles (*cytolysins*); and *opsonins* (I prepare a meal for), which appear to occur in every bacterial infection. These last link themselves with the living bacteria in the body, and render them edible by the white blood corpuscles, and are the chief factors in phagocytosis. (See IMMUNITY.) Sir A. Wright has recently devised a method by which it has become possible to estimate the relative amount of opsonins in a particular infected body to the healthy normal one, this being known as the opsonic index or curve. It has been shown both in the case of the tubercle bacillus and staphylococcus (the most common microbe of suppuration) that inoculation of a bacterial vaccine produced an initial and temporary fall of the opsonic index—the so-called negative phase. This is shortly recovered from, and at the end of recovery the opsonic curve is at a higher level than formerly—the posi-

tive phase. A similar result follows a second inoculation, with the result that the opsonic index is still further raised. Clinically the negative phase following immediately on the inoculation indicates that the invading bacteria have an increased opportunity of multiplying, and, if the dose is at all excessive, the progress of the disease may be accelerated to an alarming extent. The positive phase, on the other hand, indicates a time during which an active destruction of living bacteria is taking place, and is evidenced by a general improvement in the patient's condition. Vaccine therapy is at present only valuable for bacterial invasions which are purely local; it is of little or no value where there is a general invasion through the blood stream. In these local invasions there is a process of continuous auto-inoculation going on, which under favourable circumstances tends towards recovery. A study of the opsonic index in such cases indicates whether the stimulus of artificial inoculation is likely to prove useful. The diseases which are now treated by vaccine therapy include tuberculosis, acne, streptococcal and staphylococcal infections, bacillus coli infections, and gonococcus. The most remarkable and striking results have been obtained in the treatment of acne and other cutaneous disorders of infective origin. There are now innumerable cases of severe acne, with pustule formations, that have for years resisted treatment of the most approved kind, which have undergone a speedy and complete recovery under vaccine therapy. In an average case three to six inoculations are all that is required, these being made at intervals of a week or ten days. In a few cases of so-called mixed infection it is advisable to in-

oculate with more than one vaccine—a vaccine dose of acne bacillus and of staphylococcus being given alternately.

The application of vaccine therapy in any case demands the following preliminary work: a preliminary investigation as to the infecting organism by means of stained films of blood, sputum, pus, or urine; this is followed by the preparation of a pure culture of the invading bacteria; a determination of the patient's opsonic index to the bacteria is then made; an autogenous vaccine is then made from the pure culture and injected subcutaneously. The vaccine dose usually contains about 100,000,000 dead bacteria in sterile solution. In the case of the acne bacillus much smaller doses are required. In many cases of disease which are believed to be infective, it is impossible to determine with accuracy the source and nature of the invading bacillus. In these cases it is therefore impossible to prepare an autogenous vaccine, and in these circumstances we have recourse to stock vaccines prepared and standardized from the common organisms of each class. Separate doses are put up in special vaccine bulbs. The chief standard vaccines are staphylococcal, acne bacillus vaccines, streptococcal vaccines, and gonococcal vaccines, sold by Parke, Davis, and Co. The therapeutic efficiency of these does not appear to vary. The best results from vaccine therapy are obtained in cases where the precise nature of the invading microbe can be ascertained, and a suitable vaccine prepared (autogenous vaccine therapy). See IMMUNITY.

Vacciniaceæ, a natural order of shrubs and trees, bearing flowers with gamopetalous, globose, or campanulate corollas, and followed by baccate fruits. The bilberry, cranberry, and

huckleberry are members of this order.

Vaccinium, a genus of mostly hardy shrubs belonging to the order Vacciniaceæ. They bear globose berries, often edible and of economic value. Thus *V. myrtillus* yields the bilberry, blaeberry, or whortleberry, and *V. Oxycoccus* the cranberry. Several other species are good shrubs for cultivating in gardens.

Vacherot, ETIENNE (1809-97), French philosopher, was born at Langres, and in 1839 succeeded Cousin as professor of philosophy at the Sorbonne, Paris. Deprived of his chair in 1852 on his refusal to take the oath of allegiance to the new empire, he later entered political life as a deputy (1871-76) to the Chamber. His most important writings were *Histoire Critique de l'Ecole d'Alexandrie*, in 3 vols. (1846-51), and *La Métaphysique et la Science* (1858).

Vacquerie, AUGUSTE (1819-95), French author and journalist, born at Villequier in Normandy; became acquainted with Victor Hugo, whose devoted admirer he was. He wrote plays in the style of his master, including *Trajal-dabas* (1848), *Souvent Homme Varie* (1859), *Les Funérailles de l'Honneur* (1861), *Jean Baudry* (1863), and *Le Fils* (1866). Among his other works are *Les Miettes de l'Histoire* (1863) and other collections of essays. See *Life*, in French, by Bertal (1888).

Vacuum, a word used to describe the more or less highly attenuated gas contained in exhausted receivers. High vacua are produced in several ways, the commonest by means of the mercurial air-pump. There are two chief types of this instrument, of which the Sprengel and Toepler pumps may be taken as examples. In the Sprengel pump mercury is dropped down a tube about one metre long and two millimetres bore, with the result that the

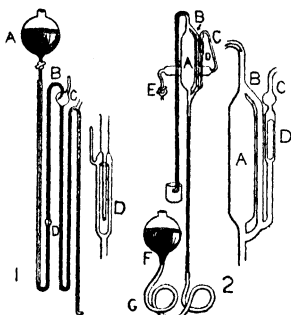
mercury breaks up into a series of pistons, which draw in the air or other gas through a branch tube connected near the top of the fall tube. In the Toepler pump a vessel is filled with mercury by raising a reservoir attached to it by a flexible tube, the air being expelled through a tube attached to the top of the vessel and bent over into a basin of mercury about a metre below. On lowering the reservoir a Torricellian vacuum is produced in the vessel, so that if it is con-

densed in the cooled tube, which can then be sealed off. This method has been made much more generally useful by the discovery by Dewar that if the tube in which the gas is to be condensed is filled with dense and recently heated charcoal, surrounding it with liquid air will be sufficient to produce rapidly a very perfect vacuum in the receiver attached.

High vacua are best measured either by observing the character of the electric discharge in them or by means of the M'Leod gauge; the ordinary manometer, in which the pressure is balanced against a column of mercury, becomes useless as soon as the pressure is reduced to less than about the 100th part of that of the atmosphere. In spark gauges, as the exhaustion proceeds the discharge is first ribbon-like, and then spreads into a luminous glow. The glow then disappears and the glass fluoresces, the discharge finally refusing to pass at the highest degree of exhaustion. In the M'Leod gauge the pressure of the highly rarefied gas in a vessel is increased by allowing mercury to flow in, and the volume of gas under the new pressure is measured in a small tube attached to the vessel; and the original pressure is calculated by applying Boyle's law. The method, however, is liable to serious error owing to condensation of the gas on the surface of the glass. See Thompson's *Development of the Mercurial Air Pump* (1888), *Jour. Soc. Arts* (1888), and Travers's *Study of Gases* (1901).

Vacuum Brake. See BRAKES.

Vacuum Engines are single-acting heat motors for small powers, the sizes varying from one-fifteenth to one-half of a horse-power. In the engine here described the top of the cylinder C is provided with a suitably

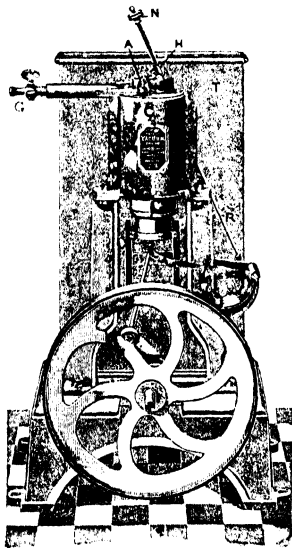


Vacuum Pumps.

1. Sprengel pump: A, reservoir; B, inverted siphon; C, exhausted globe; D, air traps.
2. Toepler pump: A, pump chamber; B, side tube; C, gas entering tube; D, glass valve; E, stopcock; F, reservoir of mercury; G, flexible tube.

connected to a receiver it is desired to exhaust, the air in the latter divides itself between the receiver and the vessel. On repeating the operation many times a high degree of exhaustion may be attained. The preparation of liquefied gases of very low boiling-point has provided a very effective means of producing high vacua. Thus, if a tube attached to the receiver to be exhausted is immersed in liquid hydrogen, almost the whole of the air or similar gas in the vessel is con-

arranged upward-acting mushroom type valve. During the first half of its outstroke, the valve being then open, the piston draws a flame into the cylinder from an ordinary bunsen type burner, supplied with gas through a pipe G, and arranged so that the flame plays immediately over the valve; the valve then closes,



The Lowne Vacuum Engine.

and by the time the piston has completed its outstroke the flame has burnt itself out. The hot gases in the cylinder are then cooled by contact with the water-jacketed walls. A partial vacuum is thus formed within the cylinder, and the pressure of the atmosphere acting on the exposed face of the piston forces it into the cylinder, and gives the engine its motive

power; the engine thus receives an impulse every revolution. The circulating water for keeping the cylinder cool is contained in a tank T, mounted on the same frame as the engine. The flame-inlet valve is lifted at the proper moment by a lever attached to a rocking bar A, which is operated through a sleeve H, rod R, and radius link L—the last receiving its motion from the end of the piston-rod. On both sides of the sleeve H there are spiral springs; the bottom one being forced against the sleeve, as the rod R rises, causes the valve to open; and in a similar manner, as the rod descends, the valve is closed. The speed of the engine can be regulated by screwing a nut N up or down the rod R; this alters the tension of the springs, and changes the opening and closing position of the valve. These engines are also designed to work with petroleum or denatured alcohol.

Vacuum Tubes. Spark Discharges.—When a sufficiently high potential difference is applied to two terminals, say two small brass spheres, separated by a distance of a fraction of an inch, an electrical discharge occurs, and a spark passes between the two terminals. The experiment is most conveniently performed by attaching the two terminals to the terminals of the secondary of an induction coil, which should be also connected to the inner and outer coating of a Leyden jar respectively. When a sufficiently strong current is sent through the primary of the induction coil, a torrent of sparks will pass between the secondary terminals. Experiments which have been made on the relation between the sparking length (*i.e.* the distance between the terminals) and the sparking potential (*i.e.* the potential difference just necessary to cause a spark to

pass) show that for a sparking distance of one centimetre, or two-fifths of an inch, a potential of 30,000 volts is necessary. If the sparking terminals are inserted in a vessel from which the air may be gradually exhausted by means of a vacuum pump, it is found that the sparking potential decreases directly as the pressure until very low pressures are reached. It is, however, impossible to force a discharge across an absolute vacuum.

Nature of the Discharge in Gases at Low Pressures.—As the pressure of a gas is reduced, the character of the discharge alters completely—no longer taking the form of a spark, but becoming much more complicated in character. In order to study the nature of the discharge at pressure of about $\frac{1}{100}$ that of the atmosphere, an apparatus of the form indicated in the accompanying diagram is very useful. (Fig. 1.)

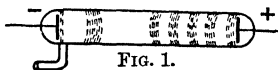


FIG. 1.

This consists of a glass tube closed at both ends, and provided with a side tube to enable it to be attached to a vacuum pump. The terminals, or electrodes as they are termed, consist of two small aluminium discs attached to stout pieces of platinum wire which are fused through the glass, and with which connection may be made to the terminals of an induction coil, or to those of a Wimshurst or other influence machine, which would serve equally well. When a discharge is passed through the exhausted tube by either of these means, the following phenomena are displayed. There is a thin layer of luminosity over the negative electrode, or cathode as it is called, succeeded by a well-defined region, known as the 'Crookes dark space,' in which

there is no luminosity. This is succeeded by a faint glow extending some little distance, called the 'negative glow,' followed in turn by another less sharply defined dark space, known as the Faraday dark space. Lastly comes a bright glow extending right up to the anode, known as the 'positive column.' Geissler tubes are vacuum tubes of a form shown in Fig. 2, similar to the tube de-

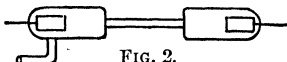


FIG. 2.

scribed above, except that they are constricted in diameter for a length of some three inches in the middle.

Cathode Rays.—The above description applies to tubes which are exhausted until the pressure is about $\frac{1}{100}$, or as low as $\frac{1}{1000}$ of an atmosphere. As the exhaustion is carried still further, the character of the discharge gradually alters, and we notice the appearance of a faint blue beam of light proceeding perpendicularly outwards from the face of the cathode, becoming more and more strongly marked as the pressure is reduced to, say, $\frac{1}{100000}$ that of the atmosphere, the other phenomena accompanying the discharge disappearing in the meantime. Where this beam of light strikes the glass side of the tube it produces intense phosphorescence. This beam is termed a bundle or stream of cathode rays, and consists of a stream of negatively charged particles moving away from the cathode with enormous velocity. When this stream of cathode rays strikes the glass of the vessel or any object in its path, in addition to phosphorescing the object becomes strongly heated. Sir J. J. Thomson has shown that cathode rays consist of negatively charged particles,

and he was enabled to calculate the ratio of the mass of a particle to the electric charge it carried (the same for every particle), and also the velocity with which they move. From other experiments the charge carried by each particle, or ion as he called them, was found, as also the mass. The charge carried by an ion works out to be of the same order of magnitude as that carried by the hydrogen ion in electrolysis, though the mass of a cathode ray ion is only about one-thousandth of that of the hydrogen atom. Kaufmann believes the mass to be entirely of electrical origin. The velocity of the rays varies enormously with the degree of exhaustion of the tube, and may be anything between $\frac{1}{100}$ and $\frac{1}{10}$ of that of light.

The charge and mass on a cathode ray particle seems to be absolutely independent of the nature of the tube, electrodes, or gas, and consequently it has been looked upon as a fundamental constituent of all matter and as the 'atom' of electricity. It is called an electron. The word electron has been loosely used by some people to denote any charged particle, but it is better to use the word ion in this sense, and confine the word electron to the cathode ray particle. The modern theory of the construction of the atom imagines it as built up of a large number of electrons forming a miniature planetary system. See ATOM.

If the cathode be perforated with a number of small holes, it is found that certain rays known as 'Canalstrahlen' are shot out behind the cathode, just as the cathode rays are shot out in front of it. The 'Canalstrahlen' have been shown to be due to positively charged particles whose mass is of the order of that of an atom. The charge carried by one of these particles is equal in mag-

nitude to that carried by one of the cathode ray corpuscles.

Lenard Rays.—If a stream of cathode rays is directed against an orifice in the vacuum tube closed by a thin aluminium window, they appear to penetrate it, giving rise to rays on the further side of it (which may be either in the open air or in a second exhausted vessel), similar in many respects to the cathode rays themselves, though instead of travelling onwards as a straight bundle, like the cathode rays, they diverge in all directions from the aluminium window. These rays are known as Lenard rays, and are quickly absorbed in air at the ordinary atmospheric pressure.

Röntgen Rays.—These rays, which are also known as X-rays, were discovered by Röntgen in 1895, and are invariably produced by the sudden stoppage of cathode rays, though unless the vacuum tube is highly exhausted they are of feeble intensity, or 'soft rays,' being rapidly absorbed in air. 'Hard rays,' produced in a highly-exhausted tube, will pass through several feet of air before diminishing appreciably in intensity. The cathode rays are usually, in a modern X-ray bulb, allowed to impinge on a piece of platinum foil placed in the centre of the bulb at an angle of 45° to the axis; the X-rays are then emitted only at the side of the bulb facing this foil. An induction coil is used to excite the bulb, and is usually, for this purpose, worked with a Wehnelt interrupter, though a large Wimshurst machine is also effective.

The real nature of Röntgen rays is not yet fully established. They are certainly not waves like light, and cannot be refracted. In all probability they consist of electro-magnetic pulses in the ether, such as would necessarily be produced by the sudden stoppage of charged particles, accord-

ing to the theory put forward by Professor Stokes.

Like cathode rays, Röntgen rays produce phosphorescence when they strike a suitable object, such as a screen covered with crystals of barium platino-cyanide; and they are capable of passing through many substances quite opaque to ordinary light—aluminium, paper, wood, the flesh, and numerous other bodies being quite transparent to these rays. The amount of absorption they undergo in passing through any substance—solid, liquid, or gas—is almost proportionate to its density, the heavier metals, for example, being very opaque to X-rays. This property of Röntgen rays is of the utmost importance in surgery, as by interposing the hand, or any part of the body, between an X-ray bulb and a phosphorescent screen, the flesh casts only a very feeble shadow, the bones a much stronger one, while any metal object present casts a perfect shadow on the screen, which may, if desired, be replaced by a photographic plate. See E. W. H. Shenton's *Disease in Bone and its Detection by the X-rays* (1911).

Ionization of Gases.—Gases are as a rule very good insulators, but there is always some trace of leakage through them. Their conductivity may, however, be enormously increased in a number of ways. Cathode rays, Lenard rays, Röntgen rays, rays from radio-active substances, and ultra-violet light all increase very greatly the conductivity of the gas through which they pass, and chemical actions produce a similar effect on the gases in the neighbourhood. The conductivity is caused by the existence of particles charged, some negatively and some positively, which of course move in opposite directions in an electric field. They are called ions, as they are exactly analogous

to the ions in electrolysis, and the process of producing them is called ionization. Positive and negative ions attract one another and soon recombine, forming uncharged particles. Thus a few seconds after the ionizing agent is removed the conductivity has disappeared, and the gas is in its normal state again.

The speed at which the ions move when carrying a current can be measured in several ways. Zeleny has measured it by opposing them with a wind, and altering the speed of the wind until it just stopped their motion altogether. Under a field of one volt per centimetre, in air at ordinary temperature and pressure, the speed of the negative ions is about 1·86 centimetres per second, and of the positive ions 1·36 centimetres per second. The number of ions can be counted by means of a property which they possess of causing water to condense on them in minute drops when the space is supersaturated with water vapour. The drops of water can be counted, and hence the number of ions. This enables the charge on each ion to be measured and the mass of it to be calculated. The results show that the charge is exactly the same as on an electron and on a univalent ion in electrolysis. The mass of the positive ion is usually a little greater than that of the negative, but both are two or three times that of the molecule of the gas. The mechanism of the ionization of gases can be easily imagined. In the article on the atom it has been stated that a number of atoms readily lose a single electron. Thus a sudden electric field may be sufficiently strong to drag an electron out of the atom and send it free into the gas. No sooner is it free, however, than it collides with uncharged molecules, and a small number of these remain attached

to it. This forms the negative ion. The remainder of the atom now charged positively also attaches one or more uncharged molecules to itself, forming the positive ion. This is what is imagined to happen with Röntgen rays, which are thought to be sudden electric pulses, and with ultra-violet light, which is known to be a series of electro-magnetic waves of very short wave length.

The shock of collision with very rapidly moving charged particles might also be sufficient to jar out an electron. Radio-active bodies keep up a continuous fusillade of extremely rapidly moving charged particles, some the size of electrons and others the size of atoms. The shock of collision with the larger particles moving with their enormous velocity causes nearly all the ionization produced by radio-active bodies.

See Sir J. J. Thomson's *Conduction of Electricity through Gases* (1903), Rutherford's *Radio-activity* (1905), Campbell's *Modern Electrical Theory* (1907), Lodge's *Electrons* (1907), and Fournier d'Albe's *The Electron Theory* (1907).

Vacz (Ger. *Waitzen*), tn., co. Pest, Hungary, on l. bk. of Danube, 20 m. N. of Budapest; exports wine and cattle. It has some Roman antiquities, and its cathedral dates from 1777. Pop. 17,000.

Vadianus, JOACHIM (1484-1551), Swiss reformer, whose family name was Von Watt, born at St. Gall; became professor of *belles lettres* at Vienna, but returned to his native place (1520), where he practised medicine, and was a disciple of Zwingli. He was the author of *Commentaria* on Pomponius Mela (1518), and *Scholia* on Pliny's *Natural History* (1531). See Pressel's *Joachim Vadian* (1851), and Güttinger's *J. von Watt* (1895).

Vadkert, comm. in Hungary, co. of Kis-Kun, 42 m. N.W. of Szegedin. Pop. 7,000.

Vadstena, tn., Swedish gov. Östergötland, on E. shore of Lake Wetter, 48 m. W.S.W. of Norrköping; has a castle of 1545 and a fine church (14th-15th century) belonging to St. Bridget's monastery (now a lunatic asylum). Pop. (1911) 2,548.

Vaduz, cap. of principality of Liechtenstein, Austria, near the r. bk. of the Rhine, 23 m. S. by W. of Lustenau. It has a 16th-century castle, with a tower of much older date. Pop. (1911) 1,296.

Vaga, PERINO DEL (1500-47), the name by which Pietro Buonaccorsi is commonly known, from his master Vaga, with whom he went first to Rome. Born at Florence, he became a pupil of Ghirlandajo. At Rome he was one of the principal assistants of Raphael in the decoration of the Vatican. In 1527 he removed to Genoa, where his chief works, arabesques, are in the Doria Palace.

Vagabond. See VAGRANT.

Vagos, comm., Portugal, 40 m. S. of Oporto. Pop. 5,000.

Vagrant. By the Vagrancy Acts, 1824 and 1838, which were extended to Scotland in 1871, persons committing certain offences named therein, or in subsequent acts, are deemed to be rogues and vagabonds, and may be sentenced to hard labour for any period not exceeding three months. Among such offences the following may be mentioned:—Wandering abroad and lodging in any barn, outhouse, or in the open air; having no visible means of subsistence, and not being able to give a good account of oneself; exposing any obscene print or picture or exhibition in any shop or public place; palmistry; telling fortunes; exposing wounds to get alms; collecting alms under false pretences; de-

serting wife or children so that she or they become chargeable upon the parish; frequenting public places with intent to commit felony; and possessing burglarious instruments. Any common prostitute wandering in any place of public resort, and behaving riotously or indecently; any person begging in any public place, or causing any child to do so; any peddler or petty chapman trading without a licence; and any person failing to maintain himself or his family, whereby he or his family becomes chargeable to the parish, being able by work or otherwise to do so, are deemed to be idle and disorderly persons, and may be sent to prison for a month. Committing any of these offences after having been convicted as an idle and disorderly person makes the person a rogue and vagabond, and punishable as such. An incorrigible rogue is one who is twice convicted as a rogue and vagabond, or one who breaks out of prison, or who, being apprehended as a rogue and vagabond, violently resists the police. He may be committed to the house of correction till the next quarter sessions, and then sentenced to whipping and one year's imprisonment. Under the Vagrancy Act, 1873, any person playing, betting, or gaming in any public place with cards, coins, etc., is also deemed a rogue and vagabond. By the Vagrancy Act, 1893, every male person who (1) knowingly lives on the earnings of prostitution, or (2) persistently solicits in any public place for immoral purposes, is to be deemed a rogue and vagabond, and dealt with accordingly. A male person who is proved to live with, or to be habitually in the company of, a prostitute, and has no visible means of subsistence, is to be taken to be knowingly living on the earnings of prostitution, unless he can satisfy the court to

the contrary. The Burgh Police Act (Scotland), 1892, contains provisions for the suppression of vagrancy in Scottish burghs.

A departmental committee was appointed by the president of the Local Government Board in 1904 to inquire into and to report on vagrancy in England and Wales, and in their report the committee recommend that casual wards should be placed under the control of the police, and conducted on a uniform system; that a distinction should be made between vagrants and persons who are *bonâ fide* in search of work; and that the latter class should be assisted, while habitual vagrants should be treated, not as criminals, but as persons who require detention on account of their mode of life. And they recommend that labour colonies for habitual vagrants should be established, and that habitual vagrants should be committed to them for detention for not less than six months or more than three years. See *Report on Vagrancy*, Cd. 2852 (1906), and Turner's *History of Vagrants* (1887).

Vaillant, FRANÇOIS DE. See LEVAILLANT.

Vaishnavas, in Hinduism, worshippers of Vishnu. The marks that distinguish them from the Saivas, the other section, are two perpendicular strokes joined at the lower extremities by a curve (the footprint of Vishnu) marked on their foreheads in red, yellow, and white pigments.

Vaisyas, the third of the four classes into which Hindus were divided on the institution of caste. Their occupations, as set forth in the Puranas, are commerce and agriculture, and the feeding of flocks and herds. At the present day nearly all who profess to be Vaisyas are merchants and traders.

Vajda-Hunyad, tn., Hungary, in Transylvania, 80 m. s.w. of Klausenburg. There are impor-

tant iron industries. The beautiful castle was built by John Hunyady, the famous Hungarian general. Pop. 4,400.

Valabbhacharya, a sect founded by one Valabha, a Telugu Brahman, born towards the close of the 15th century. Adopting at Kathiawar the worship of Krishna in its most sensuous form, he represented himself as an incarnation of that god. He died at Benares. His descendants receive adoration little short of divine honours from adherents in the Bombay Presidency and Central India.

Valais (Ger. *Wallis*), Swiss canton, the third largest in the confederacy. Area, 2,027 sq. m.; pop. (1910) 129,579, of whom two-thirds are French-speaking, and all Roman Catholics. It produces little but wine; but its wild and romantic scenery attracts many travellers in summer. Its culminating points are Dufourspitze (15,215 ft.) and the Dom (14,940 ft.). It comprises the upper course of the Rhone, and its capital is Sion or Sitten (pop. 6,519). Valais was for centuries a sister confederation of the Swiss league, which it entered in 1815. See Courthion's *Le Peuple du Valais* (1903) and *Walliser Sagen* (1907).

Valbo, comm., Sweden, in Gefleborg gov., 4 m. w. of Gefle. Pop. (1911) 10,276.

Valburg, comm., Netherlands, in Gelderland, 6 m. s.w. of Arnhem. Pop. (1910) 5,713.

Valckenaer, LODEWYK KASPAR (1715-85), Dutch philologist, born at Leeuwarden; professor of Greek at Franeker (1741-66); taught at Leyden from 1766. He issued valuable editions of Greek and Latin classics. After his death some of his works were published as *Opuscula philologica, critica, oratoria* (1808-9), and *Selecta ex Scholiis Valckenaerii* (1815-17). See Bergmann's *Memoria Valckenaarii* (1874).

Val d'Ajol, LE, comm., France, in Vosges dep., 27 m. N.N.W. of Belfort. Pop. 7,400.

Valdemar. See WALDEMAR.

Valdenses. See WALDENSES.

Valdepeñas, tn., prov. Ciudad Real, Spain, 30 m. S.E. of Ciudad Real; famous for its wine and the hot mineral springs in the vicinity. Pop. 21,200.

Valdés, ARMANDO PALACIO (1853), Spanish novelist, born at Entralgo (Asturias); the leader of the naturalist school of fiction. His best works are *Sister St. Sulpice* (Eng. trans. 1890) and *Marta y Maria* (1883). His more recent novels, such as *Faith* (Eng. trans. 1892), *Scum* (Eng. trans. 1890), and *The Joy of Captain Ribot* (Eng. trans. 1900), though strong and striking, exhibit too openly the influence of Zola to be regarded as typical Spanish creations.

Valdes, JUAN DE (c. 1500-41), Spanish reformer and writer, born at Cuenca. For the last ten years of his life (1531-40) he lived at Naples. His anonymous *El Diálogo de las Lenguas* (c. 1536), a satire on the abuses of church and state, is the finest piece of Castilian prose of that age, except perhaps *El Diálogo de Mercurio y Carón*, by the same author. His *Ciento y Diez Consideraciones Divinas*, the work by which he is best known abroad, was translated into English by N. Ferrar in 1638 and by Betts in 1865. See E. Boehmer's *Life of Valdes* prefixed to *Biblioteca Wiferriana* (1882).

Val de Travers, beautiful valley in canton Neuchâtel, Switzerland, between the ranges of the Jura, 12 m. S.W. of Neuchâtel; gives name to an asphalt cement.

Valdivia, tn., Chile, cap. of Valdivia prov., on the Valdivia R. (100 m. long), 16 m. from its mouth, and 480 m. S. by W. of Valparaiso. In December 1909 the principal part of the town and

river front and the entire commercial centre were destroyed by fire. There are tanneries, soap and candle factories, a shipbuilding yard, and breweries. Pop. 15,000. Its port is Valdivia Port (Corral), one of the best harbours on the w. coast of S. America. The principal exports are wheat, hides, whale oil, wool, and bran. The area of the prov. is 8,350 sq. m., and its pop. about 120,000.

Valdivia, PEDRO DE (c. 1510-69), Spanish conqueror of Chile. As Pizarro's lieutenant, he led the second expedition (1540) against Chile. After fighting his way to the river Mapocho, he founded Santiago, the present capital, and some ten years later a second city, which he named after himself. Meantime he was hard pressed by the Araucanians, and was killed in battle against them near Valdivia.

Valdosta, co. seat of Lowndes co., Georgia, U.S.A., 160 m. s.w. of Savannah. The city manufactures cotton yarns and knitted goods, cotton-seed oil, lumber, turpentine, and fertilizers. Pop. (1910) 7,656.

Valence (Rom. *Valentia*), tn., cap. of dep. Drôme, France, on l. bk. of Rhone, 58 m. s. of Lyons; has manufactures of flour, glass, silk, hosiery, and the printing of handkerchiefs. Its Romanesque cathedral was consecrated by Urban II. in 1095. Pop. (comm.) 28,000.

Valencia, or VALENTIA, rocky island, w. of Co. Kerry, Ireland, s. of Dingle Bay; has slate quarries, and is the terminus of several Atlantic cables, and of cables to the continent of Europe.

Valencia. (1.) Province, E. Spain, one of the most fertile districts in Europe, conquered from the Moors by James I. of Aragon in 1238; and in spite of the expulsion of the Moriscos (1610), it has always remained the most Moorish part of Spain. Watered

by the Jucar and Turia (or Guadalaviar), the plains produce rice, wine, grain, oil, and fruit in great abundance. The silk industry, once very great, is still considerable, and mats, cordage, tiles, and earthenware are largely produced. Area, 4,150 sq. m. Pop. (1910) 852,930. (2.) City, cap. of prov. of same name, Spain, on the Guadalaviar, and 3 m. from its port El Grao, on the Mediterranean. It is one of the most important cities in Spain, and stands on a fertile alluvial flat, between the mountains and the sea. It is the seat of an archbishop. Its cathedral was begun in 1262, and though much spoiled by restoration, has fine paintings of the Valencian school; and many pictures by Ribalta are in other churches and public buildings. The art school is the most important in Spain. Its university was founded about 1500, and has some 1,700 students. Tobacco, silk, fans, coloured tiles, and gloves are manufactured, and oranges, onions, melons, tomatoes, etc., exported. Pop. 215,000. (3.) Chief town of state of Carabobo, Venezuela, near the w. end of L. Valencia, 20 m. s. of Puerto Cabello, with which it is connected by rail, over a pass in the coastal range only 1,970 ft. high. There is an active trade in coffee, sugar, cacao, hides, rum, cattle, and agricultural produce. Pop. 40,000.

Valencia de Alcantara, fortified tn. of Spain, near the Portuguese frontier, in the prov. of Caceres, 30 m. s.w. of Alcantara, with old walls and a castle. Pop. 9,500.

Valenciennes (Lat. *Valentiana*), tn., dep. Nord, France, on Scheldt, 18 m. N.E. of Cambrai; has manufactures of hosiery, cambric, glass, chemicals, and iron goods. The manufacture of lace has been discontinued for many years. One mile N.W. is Anzin, the

centre of a rich coalfield. Froissart the historian and Watteau the painter were natives. Pop. (comm.) 31,700.

Valency of an element is the number of hydrogen atoms that one atom of it can unite with, or replace in a chemical compound. (See ATOMICITY.) Thus carbon is tetravalent, as one atom of it unites with four of hydrogen. Valency is determined by dividing the atomic weight by the equivalent of the element—i.e. the weight of the element that unites with or replaces unit weight of hydrogen: thus, as nine parts by weight of aluminium set free one part of hydrogen, and as the atomic weight of aluminium is 27, the valency equals $27 \div 9 = 3$. Certain compounds, such as carbon monoxide and dioxide, appear to indicate that elements may have more than one valency, and much discussion has taken place on this point. If valency is a fixed quantity, it should be a property of the atom like the mass; but if variable, it might depend on the condition of the atom, such as its temperature or electric charge. But if valency were variable and depended on the condition of the atom, it should alter gradually in any given element, and not with leaps and bounds, as is found to be the case. Thus in carbon monoxide and carbon dioxide the change is apparently from divalent to tetravalent, whilst in ammonia and ammonium chloride it is from trivalent to pentavalent. Such a difference can be explained on the fixed valency assumption, by supposing that in the compounds in which the lower valency is apparently indicated the full capacity for union is not exerted, and that such compounds are 'unsaturated'—a view that is confirmed by the readiness with which such compounds take up additional atoms without rearrangement.

On the other hand, though this idea seems to be correct in some cases, such as that of carbon, with other elements, such as nitrogen and phosphorus, the compounds in which there is the higher valency are easily broken up into different molecules—for example, $\text{PCl}_5 = \text{PCl}_3 + \text{Cl}_2$ —or are formed like ammonium chloride, $\text{NH}_3 + \text{HCl} = \text{NH}_4\text{Cl}$, without any apparent expenditure of energy (ignition) being required to split up existing molecules before the new ones could be formed, as is the case when oxygen and hydrogen combine. In cases like the formation of ammonium chloride, and to explain the formation of compounds containing water of crystallization—e.g. alum, $\text{K}_2\text{SO}_4\text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ —it has been suggested that combination of a different order to atomic union occurs, whole molecules uniting as such to form 'molecular' compounds.

To explain valency it has been calculated that the force of attraction between atoms in combination—for the union must be of that character and not of the nature of a mechanical joint—can only be uniformly distributed over the surface of the atom, if the latter is truly spherical, and that with other shapes points must exist in which there is a greater attractive force. Thus, for a monovalent atom there would be one salient point, for a divalent two, and so on—an idea that is confirmed in the case of carbon by other considerations pointing to its affinities being situated at the angles of a regular tetrahedron. Similarly, the helium and argon atoms from their physical properties are believed to be perfect spheres—a fact which, according to this theory, would explain why these elements exhibit no valency and form no compounds. In the case of nitrogen it may be imagined that there are three major

and two minor prominences, the latter having a weaker attractive force and becoming ineffective sooner when the atom is heated or otherwise agitated. Lastly, molecular compounds might quite well be formed by the attraction of minor prominences, or by the prominences formed by the various atoms in the molecule. Similar results would obtain if, as has also been suggested, instead of the various valencies being the result of differences in shape of the atoms, they are the result of different dispositions of the electrons in the atom. See J. N. Friend's *The Theory of Valency* (1909).

Valens. (1.) **FABIUS**, a lieutenant of Vitellius, whom after Nero's death he persuaded to seize the empire, and for him won the first battle of Bedriacum over Otho's troops in 69 A.D. Caccina was his colleague in this battle, and also in the government of Rome afterwards. After the victory of Vespasian, Valens, rival of Vitellius, at the second battle of Bedriacum tried to escape to Gaul, but was captured near Marseilles, and was put to death. (2.) **FLAVIUS** (c. 328-78 A.D.), emperor of the Eastern Roman empire from 364 to 378, was born in Pannonia; a brother of Valentinian I., by whom he was raised to the throne. Valens was an Arian, and his reign was marked by severe persecutions of orthodox Christians. From 373 to 375 he was at war with Persia, but without much result. The earlier years of his reign were occupied with wars with the Goths north of the Danube, in which he was usually unsuccessful; but in 377 the pressure of the Huns on the Goths caused the latter to ask for leave to settle south of the Danube. This was given; but war soon broke out between the Goths and Romans, and on Aug. 9, 378, in a great battle fought

not far from Adrianople, two-thirds of the Roman army were killed, and Valens himself perished.

Valentia. See **VALENCIA**.

Valentine, **BASIL**, the assumed name of an alchemist who lived in the 15th century, and was probably born at Erfurt. He discovered and investigated many chemical substances and processes, made a beginning with the application of chemistry to medicine, and, though his work was fantastic and obscure, distinctly advanced the dawn of chemistry as a science. See his *Currus Triumphalis Antimonii and Halographia*.

Valentine, **SAINT**, and **SAINT VALENTINE'S DAY**. St. Valentine is believed to have been a bishop who suffered martyrdom under Claudius II. at Rome, or, according to others, under Aurelian in 271 A.D., on February 14. The old idea was that the birds began to mate on that day; hence the practice of young people choosing their 'valentines' on that day by sending missives of an amatory or satirical nature, generally anonymously. The day was only observed in Britain, where, however, it has now fallen into disuse. A similar custom once prevailed in France on the first Sunday in Lent. It may have been a remnant of the pagan festival in honour of Pan and Juno (February 15).

Valentine and Orson, a famous romance of the time of Charlemagne, composed in the reign of Charles VIII. of France, and first printed at Lyons (1489). Valentine and Orson are twin brothers, Orson being carried off by a bear, and Valentine by his uncle, King Pepin. Hence the modern typification of them—the one as a specimen of uncouthness, the other of courtesy.

Valentinian, three emperors of Rome. (1.) **FLAVIUS GRA-**

TIANUS VALENTINIANUS I. (321-75 A.D.), emperor from 364 to 375 A.D., was a native of Pannonia. On his accession he associated his brother Valens with himself, making him emperor of the East, while he chose himself to rule the Western empire. Valentinian spent the greater part of his reign in Gaul, chiefly at Rheims or Trèves, improving the frontier defences of the empire along the Rhine. He won victories over the Alemanni and Saxons. Valentinian was an orthodox Christian, and tolerant to all forms of religion, though he severely punished professors of magic. He was a strong and able ruler; his private character was virtuous and unostentatious. (2.) **VALENTINIAN II.** (371-92 A.D.), younger son of the above, was chosen emperor with Gratianus, his elder brother—Valentinian ruling in name Italy, Illyricum, and Africa, while Gratian had Gaul, Spain, and Britain; but, in fact, Gratian governed the whole West until his murder, in 383. Valentinian then ruled, aided by Theodosius I.; but in 392 he was murdered at Vienne by Arbogast, commander of the Roman troops in Gaul. (3.) **VALENTINIAN III.** (420-55 A.D.), son of Constantius III. by Placidia, sister of Honorius and daughter of Theodosius I., was made emperor of the West by Theodosius II. in 425 A.D. For the first twelve or fifteen years of his reign Valentinian's mother governed for him. Under his rule Carthage was taken by the Vandals under Genseric in 439, who thus won most of Roman Africa, and proceeded in 440 to ravage Sicily. The Goths held much of Gaul, and the Vandals more of Spain. In 446 Britain was abandoned. In 451 Attila and his Huns invaded the empire, but were routed by Aetius at Châlons-sur-Marne, though in 452 they invaded Italy. In 454 the emperor was mad

enough to murder with his own hand Aetius, 'the last of the Romans.' In the next year he was himself murdered, at the instigation of Petronius Maximus, whose wife he had forced into adultery with him.

Valentinus, heretical theologian of the 2nd century, belonged to Egypt, and gained a great reputation as a philosopher in Rome (c. 140-160 A.D.), entering the lists of controversy with Justin Martyr. His views were characteristically Gnostic; his doctrines may be regarded as the high-water mark of the system. His followers split into two schools—(1) the Italian, to which belonged Ptolemaeus, Marcus, and Heracleon; (2) the Anatolian, embracing Theodotus, Axionicus, and Bardesanes.

Valenza, tn., Piedmont, N. Italy, on r. bk. of Po, 9 m. by rail N. of Alessandria; has manufactures of silk. Pop. 11,000.

Valera y Alcalá Galiano, **JUAN** (1824-1905), Spanish author and politician; entered diplomatic life in 1847, and after filling an appointment at Madrid, resigned it in 1858 to take his seat as a Liberal in the Cortes. He was minister at Frankfurt (1865-8), and ambassador at Lisbon (1881-3), Washington (1885), Brussels (1886), and Vienna (1893-95). As a man of letters he stands foremost among his Spanish contemporaries. His first production, *Canciones, Romances, y Poemas*, appeared in 1855, and was followed by the novels for which he is famous. *Pepita Jiménez* (1874) established his reputation for insight, and for power in the delineation of character. With it may be ranked *Doña Luz* (1878); and among the rest are *Las Ilusiones del Doctor Faustino* (1875), *El Comendador Mendoza* (1877), and *Juanita la Larga* (1896). *Estudios Críticos sobre Literatura* (1864) and

Nuevos Estudios Criticos (1888) are written, like his fiction, with uncommon purity of style.

Valerian, whose full name was PUBLIUS LICINIUS VALERIANUS, emperor of Rome from 253-60 A.D., rose to consular rank before 237. He associated his son Gallienus with himself in the government, and then prepared to resist the barbarians who were threatening the frontiers. The Persian Sapor's invasion of Syria and capture of Antioch (257 A.D.) appeared the most pressing necessity. Valerian recovered Antioch, and drove the Persians back beyond the Euphrates; but pressing on too fast, he was taken prisoner, and was kept for the rest of his life in captivity in Persia.

Valeriana, a genus of mostly hardy shrubs and herbaceous plants belonging to the order Valerianaceæ. They bear usually corymbs of small white or rosy flowers, with short tubular corollas. The common valerian, or all-heal (*V. officinalis*), bears corymbs of rosy flowers.

Valerianaceæ, a natural order of shrubs and herbaceous plants, mostly natives of temperate regions. Among the genera are Valeriana, Centranthus, Nardostachys, and Patrinia.

Valeric (or VALERIANIC) ACID, C_4H_9COOH , a member of the series of fatty acids, occurs in four isomeric varieties, two of which—viz. isovaleric acid and methyl-ethyl acetic acid—occur in plants such as valerian. The mixture of these two latter, which is generally known as valeric acid, is an oily liquid, with an unpleasant and very persistent odour like that of decayed cheese. It forms salts, and is sometimes employed in medicine, but is of doubtful value.

Valerius Flaccus. See FLACCUS.

Valerius Maximus (c. 30 A.D.), Roman rhetorician, wrote a col-

lection of historical anecdotes disfigured by indiscriminate flattery of Tiberius and an overloaded style.

Valetta, or LA VALETTA, tn., cap. of Malta, and most important British naval and coaling station in Mediterranean, occupies a rocky peninsula on N.E. coast. The town and its two harbours and four dry docks are defended by forts, partly constructed in 1530 by the Knights of St. John. Among the many fine buildings are the 16th-century cathedral of S. Giovanni, the palace of the grand-masters of the Knights of St. John (now the governor's palace), and the university, which has about 160 students. Pop. 62,000.

Valette, JEAN PARISOT DE LA (1498-1568), grand-master of the Knights of St. John, for many years effectively checked the advance of the Turks. His greatest feat was his defence of Malta during a four months' blockade by the Turkish fleet in 1565.

Valguarnera, tn., prov. Caltanissetta, Sicily, 24 m. E. of Caltanissetta; has trade in olive oil and sulphur. Pop. 14,000.

Valhalla, in Scandinavian mythology, the great hall of the gods, where the warriors slain in battle spent their future existence. It was entered by 540 doors, through each of which 800 warriors could march abreast. The heroes engaged in fierce warfare with one another as their daily sport, but each day their wounds were healed before they sat down to feast with Odin.

Valhalla, a building erected near Ratisbon by Ludwig I. of Bavaria between 1830 and 1842 in honour of German patriotism and liberty; 250 marble steps lead up the side of an eminence to the temple, also of marble.

Valk, tn., Livonia, N.W. Russia, 97 m. N.E. of Riga; a railway junction, with distilleries, brew-

eries, and manufactures of hydromel and flax. Pop. 10,500.

Valkyries, in Scandinavian mythology, supernatural maidens of great beauty who chose the slain in battle for transportation to Valhalla. It is they who hand to the warriors their drinking-horns at their daily feast with Odin. Their number is variously given as three or some multiple of three. The love of one of them, Brunhilda, and Siegfried is the theme of Wagner's opera *Die Walküre*. See Filson Young's *Wagner Stories* (1908).

Valla, LAURENTIUS (c. 1407-57), Italian humanist, was born at Rome; taught at Pavia, Milan, and Naples. After proving the falseness of the 'gift of Constantine' he was forced to flee to Rome. There he held various posts under Nicholas I. and Calixtus III. In philosophy Valla vindicated freer thought and methods than scholasticism had permitted; in letters his translations of Herodotus (1510) and Thucydides (1543), and his *De Elegantia Linguae Latinae* (1471), were long standard works. Erasmus edited his New Testament commentary. The *Opera* were first collected at Basel in 1543. The treatise *De Donazione Constantini* has been edited by Barozzi (1891) and Vincenti (1895), the latter in Latin and Italian. See monographs by Mancini (1892), Max von Wolff (1893), and Schwabe (1896).

Valladolid. (1.) Province, Spain, including a portion of the valley of the Douro. It is mainly agricultural, and produces much wine; but there are also considerable weaving and leather work. Area, 2,920 sq. m. Pop. (1910) 279,433. (2.) City, cap. of above prov., Spain, 100 m. N.W. of Madrid, on the Pisuerga and canal of Castile, near the junction with the Douro. It was the capital of Spain before Madrid. It is the seat of an archbishop; its cathed-

ral dates from 1585. Its university was founded in 1346, and is attended by some 4,600 students. The manufactures include textiles, silk, pottery, gold and silver work, wine, leather, and paper. Columbus died and Cervantes lived here. Here are the works of the Northern Ry. Pop. (1910) 67,742. (3.) Town, Yucatan prov., Mexico, 100 m. S.E. of Mérida; has cotton manufactures. Pop. (mainly Indians) 14,000. (4.) Pueblo, Negros Occidental prov., Philippines, on the E. shore of Guimaras Strait, 16 m. S. of Bacolod. It is a military post of importance. Pop. 10,500.

Vallauri, TOMMASO (1805-97), Italian scholar, born at Chiusa di Cuneo in Piedmont. In 1843 he was appointed professor of Latin at Turin, which chair he held until within a year or two of his death. His editions of Plautus, Terence, Horace, Catullus, and Cicero are held in special esteem. He also published a Latin lexicon, an autobiography (1879), and *Storia della Poesia in Piemonte* (1841).

Vallauris, comm., France, in Alpes-Maritime dep., 4 m. N.E. of Cannes, near the Mediterranean. Pop. 7,400.

Vall de Uxo, comm., Spain, in prov. of and 17 m. S.W. of Castellon de la Plana. Pop. 8,600.

Valle de Santiago, tn., Mexico, in Guanajuato state, 57 m. W. by S. of Queretaro. Pop. 12,600.

Valledolmo, or VALLE D'OLMO, tn., Sicily, in prov. of and 36 m. S.E. of Palermo. Pop. 5,800.

Valle, PIETRO DELLA (1586-1652), Italian traveller, was born at Rome, and in 1614 started for the East, from which he did not return until 1626. The *Viaggi in Turchia, Persia, ed India* appeared in 1650-8 (best edition by Brighton, 1843, with the Life by Bellori). It was translated into English by G. Havers (1664), and

this version was edited for the Hakluyt Society by G. E. Grey (1892).

Valle Hermosa, tn., Canary Is., on the N. coast of the island of Gomera. Pop. 5,000.

Vallejo, seapt., on San Pablo Bay, Solano co., California, U.S.A., 36 m. N.E. of San Francisco; has a good harbour, and is the outlet of a fruit-growing district. Quicksilver is mined. A United States navy yard is situated on Mare I., opposite. Pop. (1910) 11,340.

Vallelunga Pratameno, tn., Sicily, in prov. of and 18 m. N.W. of Caltanissetta. Pop. 5,400.

Valley, a land form elongated in plan, with sloping sides that meet in a minimum line, which has a more or less regular slope downwards from the head of the valley. The normal valley is water-worn, the descending minimum line being that of a stream; but in many cases, more particularly on the polar sides of latitudes 45° N. or S., at some relatively recent geological period ice has passed down the valley and left its mark on its contours. In arid and semi-arid areas an originally water-worn valley may be modified by wind action.

The normal section of a water-formed valley is V-shaped. The steepness of the sides depends on the resistance of the rock, the relationship of weathering on the sides to the activity of the stream in the bed, and the length of time for which the valley has been subjected to erosion. Valleys in semi-arid areas with a river coming from rainier lands have steeper slopes than those in rainy regions. Their tributaries do not always enter at the base of the main valley, but form 'hanging valleys.' The younger valleys are usually the more steep-sided, the older ones the more gently sloped. Where glacial action has been potent the V-shaped

valley is widened at the bottom into a U-shaped one, and the lateral valleys frequently debouch at heights considerably above the base of the main valley. Of recent years the formation of many valleys in the south of England has been attributed to underground solution. See James Geikie's *Earth Sculpture* (1898), J. E. Marr's *Scientific Study of Scenery* (1900). For 'hanging valleys' see Garwood in *Quar. Jour. Geog. Soc.* 58, *Geog. Jour.* 1910; Davis's *Appalachia*, vol. ix., 1900. For 'solution valleys,' *Geog. Jour.* 32; *Quar. Jour. Geog. Soc.* 64. The classical essay on valley formation is that by J. B. Jukes in *Quar. Jour. Geog. Soc.* 18.

Valleyfield, tn., Beauharnois co., Quebec, Canada, on r. bk. of St. Lawrence, 30 m. s.w. of Montreal, at the head of Beauharnois Canal; has cotton, paper, and flour mills, and manufactures gasoline motors. It is the see of a Roman Catholic bishop. Pop. 10,000.

Vallière, La. See LA VAL-LIERE.

Vallisneria, a genus of half-hardy, aquatic, submerged plants belonging to the order Hydrocharidaceæ. The only species is the eel grass or tape grass (*V. spiralis*), which is much grown in aquaria. The flowers are unisexual, the female flowers at the time of maturation floating on the surface of the water, whilst the male flowers become detached from the plant and also reach the surface of the water.

Vallombrosa, Benedictine convent, Florence, Italy, among the Apennines, 16 m. E.S.E. of Florence, in the midst of magnificent woodlands. It was founded about 1038 by St. John Gualbert, and rebuilt in 1637. Suppressed in 1869, the abbey is now a school of forestry and a popular summer resort. Milton alludes to it in

Paradise Lost, i. 303, and Ariosto in *Orlando Furioso*.

Vallota, a genus of S. African bulbous plants belonging to the order Amaryllidaceæ. The only species is *V. purpurea*, the Scarborough lily, which bears many-flowered umbels of red, infundibuliform flowers in late summer.

Valls, city, prov. Tarragona, Spain, 11 m. N. of Tarragona; has cotton, hemp, and woollen weaving. Wine and Barcelona nuts are also produced. Pop. 13,000.

Valmy, vil., dep. Marne, France, 20 m. N.E. of Châlons; has a pyramid to commemorate the victory of the French under Kellermann (afterwards created Duc de Valmy) and Dumouriez over the Prussians (Sept. 20, 1792).

Valognes, comm., France, dep. Manche, 10 m. S.S.E. of Cherbourg. Pop. 5,700.

Valois, HOUSE OF, a French dynasty which ruled from 1328 to 1498. The first king was Philippe VI. (1328-50). During his reign and those of John (1350-64) and Charles V. (1364-80) France was brought low by the ruinous war with England. The battles of Crécy and Poitiers (1346 and 1356) demoralized the chivalry of France, and King John was taken captive at Poitiers and conveyed to London. France reached her period of deepest depression after her defeat at Agincourt (1415). From this she was raised by Jeanne d'Arc, and Charles VII. (1422-61) was crowned at Rheims. He formed a regular army, paid by a special tax. Louis XI. (1461-83) gained power by systematically humbling the great princes and nobles. He added Maine, Anjou, Provence, and part of Burgundy to the crown. Charles VIII. (1483-98), the last of the direct line of Valois, obtained Brittany by his marriage with Anne. He died without male

issue, and the crown fell to Louis, son of Charles, Duke of Orleans, who ascended the throne as Louis XII.

Valois, CHARLES DE. See ANGOULÊME, DUC D'.

Valona. See AVLONA.

Valonia consists chiefly of the acorn cups of *Quercus agrilops*, and is usually employed in tanning along with oak bark.

Valparaíso. (1.) Chief port of Chile, cap. of prov. of same name, situated on a bay, well sheltered, except from the N. The town, built partly on the shore, partly on the slopes of the hills, which rise from 1,000 ft. to 1,400 ft. behind it, is modern, and resembles English towns in appearance. The harbour is strongly fortified, and is (1911) to be improved at a cost of some £3,000,000; the Chilean naval school is situated near the town. Typhoid fever is very prevalent. In 1908 the total imports were valued at £8,839,580, and the exports at £922,220. About 3 m. E.N.E. of the town is the watering-place of Viña del Mar (pop. 26,000). The town was practically destroyed by earthquake in August 1906. Pop. 163,000. The province is broken and diversified, and has many fertile valleys, producing abundant crops. Its area is 1,950 sq. m., and pop. (est. 1910) 285,000. (2.) Capital of Porter co., Indiana, U.S.A., 41 m. S.E. of Chicago; is the seat of the Northern Indiana Normal School. It manufactures educational specialties, lumber, flour, and paints. Pop. (1910) 6,987.

Valpy, RICHARD (1754-1836), schoolmaster, born in Jersey; was headmaster of Reading school (1781-1830), and in 1787 also became rector of Stradishall, Suffolk. His classical grammars achieved a wide reputation. Valpy's brother Edward (1764-1832) was author of *Elegantia Latinæ* (1803) and *The Greek Testament, with English Notes* (1815).

Valreas, comm., France, in a detached portion of Vaucluse dep., 95 m. s. by E. of Lyons. Pop. 5,500.

Vals-les-Bains, comm., France, in Ardèche dep., 79 m. s. by w. of Lyons; has celebrated mineral springs, the waters of which are extensively bottled and exported. Pop. 4,300.

Valtellina, the valley of the upper Adda, Sondrio prov., Italy. It extends 44 m. westward to Lake Como, and includes the Liro valley.

Valuation. See APPRAISEMENT, RATING, DOMESDAY BOOK, and EXTENT.

Valuation List. See RATING.

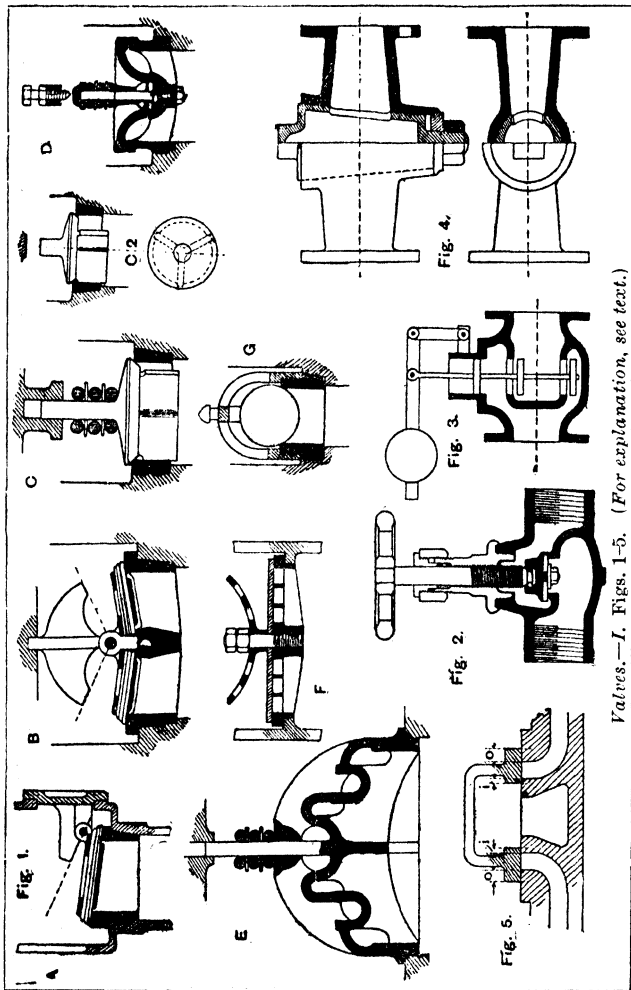
Value, the fundamental conception in the science of economics, is the quality which makes wealth. It is not to be confounded with price, which is value expressed in terms of one article—viz. gold or silver. All values are not capable of being expressed in such terms. Consequently there may be wealth that has no price, but never wealth that has no value. Political economists are chiefly concerned with the question of the origin of value, and they have drawn very many useful distinctions, the most important of which is that between value in use and value in exchange. To the latter they confine the term value; and for them, as for the business world, an article has value when somebody will give something for it. But what determines this willingness to give something? The answer is 'value in use,' or, as economists prefer to call it, 'utility.' Utility for the economist signifies any article or commodity which satisfies some desire of man. There is no moral judgment implied, and strong drink and temperance trusts alike may have value. But things have different values, and whence arises the difference? It is the

relative scarcity that determines the relative value. For measure of value and standard of value see MONEY. See Smart's *Introduction to the Theory of Value* (1891).

Valves, in botany, the two halves of which the microscopic unicellular plant known as diatom is composed. One of these valves fits over or overlaps the other. They are also known as frustules. The term valves is also applied to the pieces into which the capsule of a flowering plant breaks.

Valves. A valve is a contrivance for controlling the motion of a fluid along a passage.

Automatic Valves.—The accompanying figures show some of the common types of automatic valves. (Fig. 1.) A is a flap valve, consisting of a hinged metal plate, with a piece of leather fastened to it to make the joint. A guard prevents the valve from opening too far. Small valves of this kind work well at low pressures if the number of beats be not too great. They are often fitted to suction pipes of pumps to prevent the water from draining out of the pump when it is not working. At B we have two flat valves placed back to back and known as a 'butterfly valve.' C is a mushroom or poppet valve. It consists of a brass disc sitting on a brass seat, usually conical, but sometimes flat. It is guided by three feathers or wings below the valve, which work easily in the seating. C2 gives the plan and section of an ordinary mushroom valve; the valve C is shown with an arrangement to facilitate closing, consisting of three rubber rings separated by washers, a certain amount of lift usually being allowed before the rings begin to act. Sometimes a spring is used instead of the rubber rings; but often the valve closes merely by its own weight. In order to give the same area of flow as in the pipe, the lift of a



Valves.—I. Figs. 1-5. (For explanation, see text.)

valve of this type is one-quarter the diameter of the valve. To ensure the valve closing tightly, the bearing surface must be narrow (from $\frac{1}{8}$ to $\frac{3}{8}$), and in a large valve, having the necessary lift, the shock of closing would be sufficient to damage the seating and valve face. This difficulty is to some extent got over in the double-beat valve, shown at D; this has two seats, and requires only half the lift that would be necessary with a single-beat valve of the same diameter. At E is shown a four-beat valve, as used on large pumping engines. F is an india-rubber disc valve. It consists of a circular plate of rubber resting on a gun-metal grid, and held at the centre by a bolt, a saucer-shaped guard-plate limiting the rise of the rubber disc. This type of valve is much used for air pumps of condensing engines. G represents a ball valve, a type often used for small high-speed pumps.

Non-automatic Valves.—Fig. 2 represents an ordinary stop valve to be opened and closed by hand. It consists of an ordinary lift valve, raised and lowered by a screwed spindle working in a nut. The spindle passes through a stuffing box to prevent leakage, and is provided with a hand-wheel. The valve is so fixed to the spindle that it does not turn with it, to prevent grinding of the valve on its seat. For steam-valves the valve faces are of gun-metal; for water-valves one of the faces may be india-rubber, leather, or fibre.

Reducing Valves.—Fig. 3 shows diagrammatically a valve for reducing the pressure of a gas below the pressure of supply. It consists of a double-beat or equilibrium valve, worked by a piston, the piston being loaded by means of a weighted lever. When the pressure rises above that corresponding to the load on the pis-

ton, the piston rises and closes the valve; when the pressure falls below this amount, the weight forces the piston down, opening the valve. A dashpot (not shown in the figure) is provided to prevent the tendency of the piston to oscillate up and down, technically known as 'hunting.' The efficient working of these valves depends upon there being very little friction in the working parts; but in all cases, if the vessel on the low-pressure side of the valve is not capable of carrying the full pressure behind the valve, a relief valve should be fitted, to guard against failure of the reducing valve.

Cocks.—These are valves consisting of a conical plug, fitting in a corresponding seating. (See Fig. 4.) There is a hole through the plug, which coincides in one position with the passage in the seating. By rotating the plug the blank portion is brought opposite the hole in the seating, and blocks the passage. The conical form of the plug enables it to be reground when necessary. Owing to the suddenness with which they close, cocks are not suitable for use as water-valves, unless the velocity of the water in the pipe is small, as the sudden stopping of the motion of the water on closing the valve subjects the pipe to considerable shocks.

Slide-valve.—This is the valve chiefly used to regulate the admission of steam to the cylinder of an engine. The ordinary D valve (Fig. 5) and its modifications, the double-ported valve (Fig. 6), and the Meyer valve with variable expansion gear (Fig. 8) are dealt with under STEAM-ENGINE. The piston valve, which in principle is similar to the D valve, is illustrated in Fig. 7. The valve, PV, works in two cylindrical seatings, BB, in which are cut a number of steam ports, SP, affording communication between the

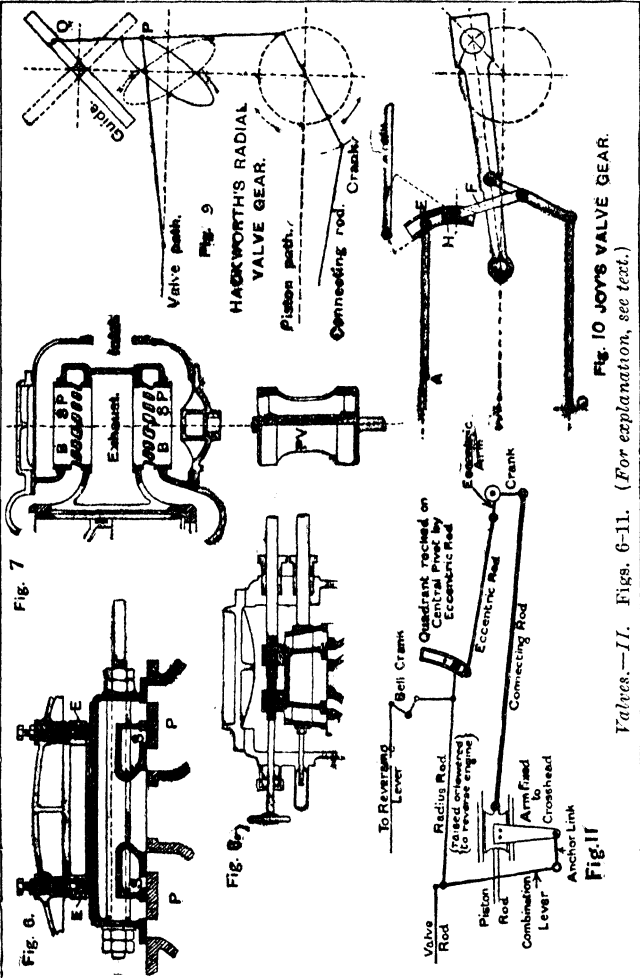


Fig. 6-11. (For explanation, see text.)

steam-ways of the cylinder and the steam-chest. The valve, reciprocating in BB, places the steam-ways in connection with the steam-chest and the exhaust alternately. This type of valve is widely used for locomotives and marine engines. The advantages of the valve are—(1) that, owing to the steam pressing equally on the ends and moving surfaces, the resistance due to friction is small (only about one-ninth that of the ordinary D valve), and consequently the wear of valves, eccentric straps, and valve gear generally is reduced to a minimum; (2) if the valve breaks, the broken parts are held in place, and cannot enter the cylinder.

Valve Gears.—The Stephenson link motion (Fig. 9) is described under STEAM-ENGINE. Of other valve gears which enable the engine to be reversed, the most efficient are Hackworth's (Fig. 10), Joy's (Fig. 11), and Walschaert's (Fig. 12). In the Hackworth radial valve gear the valve motion is taken from an eccentric fixed opposite the crank, and communicated to a radius rod at P through an upright rod attached to a block, Q, which slides up and down in a guide. The inclination of this guide, pivoted at the centre, is controlled by the reversing lever, and can be altered at will, so affecting the position and motion of the valve. The elliptical path described by P is compounded of the rotary movement of the eccentric and the oblique vertical movement of Q. Joy's valve gear takes its motion from the connecting rod, through a short lever attached to a horizontal lever pivoted on a fixed point, P. Motion is imparted through F to a block, H, working up and down in a stationary quadrant guide, and through it to the radius rod AE, which operates the valve. To reverse the engine the guide is tilted over

in the opposite direction. The Joy gear is simple, light, and correct in its working, giving lead and cut off exactly equal for both ends of the cylinders, and in all positions of the guide. In Walschaert's motion, shown diagrammatically in Fig. 12, the travel of the valve is derived from two distinct sources—the crosshead, and an eccentric or return crank set at right angles to the main crank. Reversal of the engine is effected by lifting or lowering the radius rod. This gear is particularly suitable for locomotives with outside cylinders, and is now widely used in America and on the Continent. See Dalby's *Valves and Valve Gear Mechanisms* (new ed. 1906), Zenner's *Valve Gears* (4th ed. 1905), Hurst's *Valves and Valve Gearing* (4th ed. 1905), and *The Locomotive of To-day* (3rd ed. 1904).

Valjevo, or VALJEVO, tn., Servia, 46 m. s.w. of Belgrade. It is the centre of a plum district. Pop. 7,600.

Vambéry, ARMINIUS (1832), Hungarian traveller and Orientalist, was born at Szerdahely, on an island in the Danube. After teaching himself Turkish and Arabic, Vambéry, disguised as a dervish, penetrated to Khiva and Bokhara as far as Samarkand (1862-4). This is described in *Arminius Vambéry, his Life and Adventures* (1883), and *Travels and Adventures in Central Asia* (1864); also in *Sketches of Central Asia* (1867). After his return home he was appointed professor of Oriental languages at the University of Budapest. He has written on the *History of Bokhara* (1873), *The Central Asian Question* (1874), *The Coming Struggle for India* (1885), *Story of Hungary* (1887), *Western Culture in Eastern Lands* (1906), and on the ethnography and literature of Central Asia. He is a strenuous advocate of Britain

as opposed to Russia throughout the East. See *The Story of my Struggles: the Memoirs of A. Vambéry* (2 vols. 1904).

Vampire. As stated in Horace Walpole's *Letters* (vol. i. p. 109), George I. was fully convinced that such creatures actually existed. The supposed characteristics of vampires are these:—They are men and women who have apparently died, but who continue to live in their graves without any signs of corporeal decay. It is their nightly custom to emerge from the tomb and suck the blood from sleeping people, returning night after night to the same victim, who consequently languishes and dies. An excellent idea of this superstition is obtained from Mr. Bram Stoker's novel of *Dracula* (1897). The vampire was known to the people of Chaldæa and Babylon, and is referred to in an Assyrian tablet in the British Museum. The creature mentioned in Proverbs (30:15) as a 'horse leech' is also spoken of as a vampire. The werewolf is in several respects akin to the vampire. In his tale of 'The Vampire' in *Gypsy Folk Tales* (1899), F. H. Groome states that he takes that word as an equivalent for *revenant*, or spectre. For a very full and interesting account of the ancient and modern Greek belief in them, see J. C. Lawson's *Modern Greek Folklore and Ancient Greek Religion* (1910).

Vampire-bat. The true vampire-bats are *Desmodus rufus* and *Diphylla ecaudata*, both South American forms. The former has been actually captured in the act of blood-sucking, like the vampire of fable. The first species is only three inches long, and the second smaller, and the victim in the case described by Darwin was a horse. The bat seems to cut through the skin with its sharp incisor teeth, and then sucks the blood which ex-

udes from the wound. The so-called great vampire (*Vampirus spectrum*) of S. America is a very ugly creature, with a wing expanse of twenty-eight inches; but it is largely a fruit-eating form, and there is no proof that it ever sucks blood.

Van, chief tn. of vilayet of same name, Armenia, Asiatic Turkey, near E. shore of Lake Van, 145 m. S.E. of Erzerum; has manufactures of cotton goods and moiré. Its citadel crowns an isolated ridge, on which appear cuneiform and other inscriptions. The suburb Baghlar extends over the plain below. Van is believed to occupy the site of Thospia, the capital of the kingdom of Biaina. Pop. 30,000. The vilayet has an area of 15,170 sq. m. and a pop. of 380,000. Lake Van extends about 80 m. E. to W. and from 20 to 40 m. N. to S.; it is salt, and has no visible outlet.

Vanadium, V, 51.2, a somewhat rare metallic element, of which the principal sources are mottramite, a lead-copper vanadate, and vanadinite, or lead vanadate. The ores are converted into ammonium metavanadate, from which the acid anhydride, vanadium pentoxide, and the vanadates are obtained. The element itself is set free by the reduction of the dichloride in hydrogen. Vanadium is a gray, very infusible metal (m.p. 1,650° C., sp. gr. 5.9), and though it has been experimented with as a component of steel, has hardly been applied on the commercial scale. It yields several oxides, the lower ones being metallic powders, whilst the higher, V₂O₅, yield vanadic acid, which, with the vanadates, is employed in the preparation of aniline black and for colouring glass.

Van Beers, JAN (1821-88), Belgian poet (surnamed 'the Elder' in distinction from his son, the well-known Belgian painter), was

born at Antwerp, and became sub-librarian of the communal library; thereafter teacher of the Dutch language and literature at Malines, then at Lierre, until he was elected professor of this subject at the Antwerp Athenæum. His grammar and reading-book did much to help on the Flemish revival. His poems have had the same influence, the chief being *Jakob van Maerlant* (1860), *Jongelingsdroom* (1853), *Levensbeelden* (1858), *Rijzende Bladen* (1883). Collected editions of his poems appeared in 1873, 1884, and 1885. See *Life*, by Stecher, in *Annuaire de l'Acad. Roy. de Belgique* (1890).

Vanbrugh, IRENE and VIOLET, English actresses, were born at Exeter. Irene was a member of Mr. Toole's company in 1889. She toured in Australia, and was associated with Sir H. Beerbohm Tree in 1892. Violet appeared in London first with Mr. Toole, and then joined the Kendals. She toured in America, and was associated with Sir Henry Irving as Anne Boleyn in *King Henry VIII*.

Vanbrugh, or VANBURGH, SIR JOHN (1664-1726), English dramatist and architect, was born in London. He served in the army from 1686 to 1696. His first play, *Relapse*, appeared in 1697; it was followed by *Æsop* and *The Provok'd Wife* (1697), *The False Friend* (1702), *The Confederacy* and *The Mistake* (1705). In 1701 he built Castle Howard, and in 1705 drew up plans for Blenheim House, which were ultimately carried out. Vanbrugh became comptroller of works (1702), Clarencieux king-of-arms (1704-26), and was knighted in 1714. His plays are gross, but are sparkling with wit, while his architectural works are original and massive. See W. C. Ward's *Life of Vanbrugh* (1893).

Van Buren, MARTIN (1783-1862), eighth president of the United States, born at Kinder-

hook, Columbia co., New York; practised law at Hudson from 1809. He became a member of the United States Senate (1821), governor of the state of New York (1828), and secretary of state (1829). He was elected vice-president of the United States (1832), Jackson being president, which position he succeeded to (1837). The great monetary crisis of 1839, when many banks suspended payment, was attributed to the finance system of Jackson and Van Buren, so that the latter was easily defeated for the following presidency by General Harrison (1841). In 1848 he again stood, and divided the Democratic vote with Cass; but both were defeated by Zachary Taylor. Van Buren was a singularly able tactician in politics, which obtained him the title of the 'Little Magician.' He wrote *Inquiry into the Origin and Course of Political Parties in the United States* (1837). See Shepard's *Martin van Buren* (1888), and Bancroft's *Martin van Buren* (1889).

Vancouver. (1.) Town, British Columbia, 15 m. N. of Fraser R., on Burrard Inlet, is the western terminus of the Canadian Pacific Ry. Till 1885 its site was a dense forest. It has an opera house, public parks, a trade in timber, an excellent harbour, from which the Canadian Pacific steamers sail for Japan, China, and Australia. Its industries include lumber, ship-building, flour mills, fishing, foundries, and sugar and oil refineries. In 1909-10 its imports were valued at £3,453,000, and its exports at £1,554,000. Pop. (1911) 100,333. **(2.)** City, Washington, U.S.A., co. seat of Clarke co., 7 m. N. of Portland, Oregon. The military department of the District of Columbia has its headquarters here. Lumbering, fruit-growing, and dairying are the industries of the district, and

there are flour mills, canneries, and breweries. Pop. (1910) 9,300.

Vancouver, GEORGE (1758-98), British navigator, accompanied Cook on his voyages in 1772-4 and 1776-9. In 1791-2 he explored the north-west coast of America up to 56° N., also surveying southward as far as 35° N. His account of the expedition appeared in 3 vols. (1798). Vancouver's name was given to the large island which he surveyed off the coast of British Columbia.

Vancouver Island, part of the Canadian province of British Columbia, lies on the Pacific coast between lat. 48° 19' N. and 50° 53' N. It is separated from the mainland by Queen Charlotte Sound, Johnston Strait, Strait of Georgia, and Strait of Juan de Fuca, which separates it from the United States. The surface of the island is hilly (Victoria Peak, 7,484 ft.), and covered with dense forests; and the coasts are bold and rugged, being indented by many long, narrow, fiordlike harbours. The climate is very mild. The island is rich in minerals, and has valuable coal fields at Nanaimo and at Comox. Gold, copper, and iron also occur. There are several sawmills. The fisheries are valuable. Vancouver was discovered in 1592 by Juan de Fuca. Area, 15,937 sq. m. Pop. 55,000.

Vandals, a Germanic tribe, probably closely akin to the Goths. In history they first appear about 150 A.D., dwelling on the south coast of the Baltic and on the banks of the Oder. It was probably a southern division of the people, settled in Bohemia, who took part with the Quadi in the Marcomannic war in the time of Marcus Aurelius (167 to 175 A.D.). About 240 some of them joined the Goths in occupying, first the country N. of the Black Sea, and then the Roman province of Dacia. In 277 the Emperor Probus placed

a colony of Vandals in Britain. In 405 they invaded Italy, under their king Radagaisus, along with the Alani, Burgundians, and Suevi. But whilst besieging Florence they were surrounded by the Romans under Stilicho and forced to surrender, and their king and 20,000 men perished. The rest of the horde poured into Gaul, and though the Vandals alone were defeated by the Franks, and lost 20,000 men again, yet, reinforced by the Suevi, Burgundians, and Alani, they overran Gaul, and committed all the excesses of barbaric devastation which have made their name proverbial. In 409 they passed into Spain, and in 422 took Seville and Carthage, and gave their name to Andalusia. On the invitation of the Roman Bonifacius, in 429 they invaded Africa under their king Genseric or Gaiseric. In Africa they took Hippo Regius in 431, and Carthage in 439; then, though compelled to abandon the Mauritanian provinces, they ruled the coast from Tangier to Tripoli. Soon they built a fleet, ravaged Sicily, sacking Palermo, and in June 455 landed at the mouth of the Tiber, and plundered Rome from the 15th to the 29th of June. Practically all its treasures, including the golden table and candlestick from the temple at Jerusalem, were carried to Carthage, with thousands of captives. For years the Vandals continued to harry the Mediterranean coasts; they conquered the island of Sardinia, and, repulsing a Roman attack in 468, added Sicily to their rule. Their power was at its height when Genseric died (477). In his time the Vandals became Christian; but they were Arians, and fiercely persecuted orthodox believers and other heretics. In 533 the Byzantine general Belisarius landed in Africa. The Vandals were

several times defeated, and Carthage was entered on Sept. 15, 533; and in November of the same year they were routed in the decisive battle of Tricamaron. In 534 Africa, Sardinia, and Corsica were restored to the Roman empire. As a nation the Vandals soon ceased to exist. See Martroye's *L'Occident à l'Époque Byzantine—Goths et Vandales* (1904); Gibbon's *Decline and Fall of the Roman Empire*; and Stuart Jones's *Roman Empire* (Story of the Nations Series), 1908.

Vandamme, DOMINIQUE JOSEPH (1771-1830), French general, was born at Cassel (dep. Nord). He commanded under Napoleon in Germany, but was in 1813 forced by the Russians to surrender, with 10,000 men, at Kulm. After an imprisonment in Russia he returned to France, and commanded a corps under Grouchy during the 'hundred days.' Exiled in 1816, he returned to France in 1824. See Du Casse's *Le Général Vandamme et sa Correspondance* (1870).

Vanderbilt, CORNELIUS (1794-1877), American financier, was born at New York. In 1849 he established a line of steamers to California, and, during the Crimean war, to Havre. Towards the close of his life he became a 'railway king.' At his death he left an immense fortune (about a hundred million dollars). He had shortly before founded the Vanderbilt University at Nashville, and bestowed on it a million dollars.—**WILLIAM HENRY**, his son (1821-85), born in New Brunswick, New Jersey, vastly extended his father's railroad schemes, and developed that system of government by individual capitalists which characterizes American undertakings. His eldest son, **CORNELIUS** (1843-99), and his second son, **WILLIAM KISSAM** (1849), have carried on the policy of the Vanderbilt system.

Vanderdecken. See **FLYING DUTCHMAN**.

Van der Goes, HUGO. See **GOES**.

Van der Poorten-Schwartz, J. M. W. See **MAARTENS**.

Van de Velde, WILLEM, THE ELDER (c. 1611-93), Dutch painter, born at Leyden. In early life he was a marine painter to the Dutch states, but in 1657 was appointed painter of sea-fights to King Charles II. of England, subsequently holding the same post under James II.

Van de Velde, WILLEM, THE YOUNGER (1633-1707), Dutch painter, was born at Amsterdam. He was appointed (1677) marine painter to Charles II., and won great fame. See Michel, *Les Van de Velde* (1892).

Van Diemen's Gulf, on the N. coast of Northern Territory, Australia, S. of Coburg peninsula, and E. of Melville I. It is crossed by 12° S. and 132° E. Length, E. to W., 100 m.; breadth, 60 m.

Van Diemen's Land. See **TASMANIA**.

Van Dyck, SIR ANTHONY (1599-1641), Flemish portrait painter, was born at Antwerp; entered Rubens's studio when about fifteen. When seventeen he had pupils of his own. From 1620-5 he travelled in Italy; on his return to Antwerp he became the chief court painter of his day, and during the next six years produced his finest historical and religious works, most of which are in Antwerp. Until he sojourned in Italy his style was closely modelled on that of Rubens; in the fine portraits of his Genoese period (two in Edinburgh) he developed a more restrained manner. Though Flemish by birth and training, he was influenced by the stately dignity of the Spanish grandee. In 1621 he painted for James I. in England, and in 1632 was appointed court-painter to Charles I., and

knighted. He was always 'magnificently dressed, had a numerous and gallant equipage, and kept a good table.' England has the finest and largest collection of his portraits—mostly in private galleries. His influence on the development of the English school was great and lasting. His immediate pupils were: William Dobson (1610-46), Henry Stone (d. 1653), James Gandy, who worked in Ireland, and the Scottish painter George Jamesone. He was a remarkably fine etcher, as his portraits of Vorsterman, Snyder, and his own effigy testify. He also sketched in *grisaille* the heads of eight illustrious men of his day, which were engraved and published, with certain additions, in 1645; and again, 124 plates, in the edition of 1759. See *Van Dyck*, by Percy Rendall Head (1887); *Etchings of Van Dyck*, by Frank Newbold (1903); and Lionel Cust's *Anthony Van Dyck* (1900), and his *A Further Study* (1911).

Van Dyke, HENRY (1852), American author, born in Germantown, Pennsylvania, became pastor of the United Congregational Church in Newport, Rhode I., and later of the Brick Presbyterian Church, New York, whence he went to Princeton as professor of English literature (1900). He has written *The Reality of Religion* (1884), *Story of the Psalms* (1887), *The National Sin of Literary Piracy* (1888), *The Poetry of Tennyson* (1889), *Sermons to Young Men* (1893), *The Christ-Child in Art* (1899), *Little Rivers* (1895), *The Other Wise Man* (1893), *Fisherman's Luck* (1899), *The Blue Flower* (1902), *The School of Life* (1905), *Americanism of Washington* (1906), *The House of Rimmon* (1908), *The White Bees, and other Poems* (1909), etc.

Vane, SIR HENRY, THE ELDER (1589-1655), English secretary of state, born in Kent. In 1639 he

was made treasurer of the royal household. He sat in Parliament for Lostwithiel (1614), Carlisle (1621-6), Retford (1628), and was sent to negotiate peace between Holland and Spain (1629-30), and to arrange terms with Gustavus Adolphus of Sweden (1631). He became secretary of state (1640). Being dismissed from office by Charles I., Vane joined the opposition (1641), and represented Kent in Cromwell's first Parliament. See Collins's *Life of Vane*, under title of *Earl of Darlington* (1812).

Vane, SIR HENRY, THE YOUNGER (1613-62), English author and statesman, was born at Hadlow in Kent. He became governor of Massachusetts (1636), but returned to England (1637), where he became joint treasurer of the navy (1639-41). He represented Hull in the Short Parliament, and was knighted (1640). Vane was a notable leader of the parliamentary party during the Long Parliament; was one of the commissioners who promoted the Solemn League and Covenant (1643); and succeeded Pym as leader in the House. With Cromwell he passed the 'accommodation order' (1644), but took no part in the execution of Charles. He was elected member of the Council of State (1649), was one of the commissioners who negotiated the union of England and Scotland (1652), and took a prominent part in the government of the commonwealth till 1653, when he retired into private life. For publishing *Healing Question* (1656) he was imprisoned for four months, but returned to Parliament after Cromwell's death (1658). After the restoration (1660) he was executed by Charles II. He was an able speaker and a sound statesman. See *Life* by J. K. Hosmer (1888), and by W. W. Ireland (1905).

Vanessa, a genus of butterflies belonging to the family Nym-

phalidæ, and including some handsome and conspicuous species, often very abundant. The club of the antennæ is short and bold, and the eyes are extremely hairy. The British species are the Camberwell beauty (*V. antiopa*), the great tortoise-shell (*V. polychloros*), the common tortoise-shell (*V. Urticæ*), whose caterpillar is found on the nettle, the red admiral (*V. atalanta*), the painted lady (*V. Cardui*), and the beautiful peacock (*V. Io*), with its eyed wings.

Vane-Tempest-Stewart. See LONDONDERRY.

Van Eyck. See EYCK.

Vanga, a dist. of Seyidie prov., British E. Africa Protectorate.

Vanguard, British battleship of 19,250 tons and 21 knots, launched at Barrow in 1909. Armament, ten 12-in. guns. Length over all, 536 ft.; beam, 84 ft.

Van Helmont. See HELMONT.

Van Helst. See HELST.

Vanilla, a genus of climbing tropical orchids, which bear thick leaves, and spikes or racemes of large flowers, not usually of much beauty. *V. planifolia*, is the chief source of the vanilla of commerce.

Vanillin. See PERFUMERY.

Vanini, LUCILIO, or JULIUS CÆSAR (1584-1619), Italian philosopher, born at Taurisano, near Naples; wandered through central Europe teaching; but the unorthodox character of his teaching, which had a pantheistic tendency, aroused the enmity of the Church, and after an unsettled life he was cruelly executed. His works, which include *Amphitheatrum Aeternæ Providentiæ* (1615) and *De Admirandis Naturæ . . . Arcanis* (1616), have been republished by Rousselet (1842). See *Life*, in French, by Vaisse (1871), and, in Italian, by Palumbo (1878).

Vanity Fair, the first of modern 'society journals,' was founded in 1868 by Mr. Thomas Gibson Bowles. A peculiar pungency was imparted to its pages by the malicious but clever pen of Grenville Murray. A palpable hit was scored by *Vanity Fair* when it produced a caricature in colours of 'Dizzy,' done by M. Pellegrini. The drawing was signed 'Ape,' and caricatures of the political and social notabilities of the day bearing the same signature continued to appear each week. In 1872 'Ape' was succeeded by 'Spy'—Mr. Leslie Ward—who has drawn for *Vanity Fair* ever since.

Vaniyambadi, munic. tn., Salem dist., Madras Presidency, India, on the Palar R., 38 m. s.w. of Vellore. Pop. 12,000.

Van Lennep. See LENNEP.

Vanlco, JEAN BAPTISTE (1684-1745), French artist, of Dutch extraction, was born at Aix. He acquired a high reputation as a portrait painter, and was admitted to the Academy in 1731. In 1735 he was professor of painting at Paris.—CHARLES ANDRÉ (1705-65), his younger brother, was also a painter. He was born at Nice, and painted for the king of Sardinia a number of pictures from Tasso. He became an Academician in 1735.

Vännäs, comm., Sweden, in Vesterbotten gov., 136 m. N.N.E. of Sundsvall. Pop. (1911) 5,975.

Vannes, quaint seap. tn., cap. of dep. Morbihan, France, at the mouth of the riv. Vannes, 28 m. E. of Lorient; has shipbuilding, oyster-fishing, and manufactures of ropes, woollen, linen and cotton goods, and leather. Vannes was a favourite residence of the dukes of Brittany. Pop. (comm.) 23,000.

Vannucci. See ANDREA D'AGNOLO.

Vannucci. See PERUGINO.

Van Ostade. See OSTADE.

Vansittart, NICHOLAS, FIRST BARON BEXLEY (1766-1851), English politician, born in London. His pamphlets in support of Pitt led to his entering Parliament as member for Hastings (1793). He became chancellor of the Exchequer (1812-22), and in 1823 was created Baron Bexley, and appointed chancellor of the Duchy of Lancaster. See *Vansittart Papers* (MSS. in British Museum).

Van't Hoff, JACOBUS HENRICUS (1852-1911), Dutch chemist, was born at Rotterdam; was appointed teacher of chemistry in the veterinary college of Utrecht in 1876, in 1878 professor in Amsterdam, and finally, in 1893, professor of chemistry at Berlin. To Van't Hoff physical chemistry as a distinct branch largely owes its existence. In 1874 he enunciated his theory as to the disposition of the atoms of compounds in space—a theory which has been the means of the most far-reaching advances. This was followed by his investigation of the osmotic pressure of dissolved substances; his theory, that such bodies when in dilute solution are in a state closely corresponding to that of a gas, has been very fruitful in chemistry, in physics, and in physiology. He published (all translated into English) *Chemistry in Space* (1891), *Studies in Chemical Dynamics* (1896), and *Lectures on Theoretical and Physical Chemistry* (1899), also *Zur Bildung der organischen Salzablagerungen* (1905, etc.); and, along with Ostwald, edited the *Zeitschrift für Physikalische Chemie* (1897). In 1901 he received the Nobel prize for chemistry. See E. Cohen's *J. H. Van't Hoff* (1899).

Van Tromp. See TROMP.

Vanua Levu. See FIJI.

Van Veen. See HEEMSKERK.

Vanves, comm., France, in Seine dep., forming a S.E. suburb of Paris. Pop. 12,500.

Van Wert, co. seat of Van Wert co., Ohio, U.S.A., 27 m. W.N.W. of Lima. It has railway shops, oil-wells supply works, machine shops, canning factories, flour mills, etc. Pop. (1910) 7,157.

Vapereau, LOUIS GUSTAVE (1819-1906), French author, born at Orleans; went to Paris in 1852, and prepared his *Dictionnaire Universel des Contemporains* (1858), a standard work of reference, which he followed up with a yearly publication, *L'Année Littéraire et Dramatique* (1859-69). In 1877 he became inspector-general of public instruction, and published his *Dictionnaire Universel des Littératures*.

Vapour. See GASES AND VAPOURS.

Var, maritime dep. of S.E. France, between depts. Bouches-du-Rhône and Alpes-Maritimes. It covers an area of 2,333 sq. m. It is mountainous (Signal des Chens, 5,620 ft.), with fertile valleys, and its coast is deeply indented. Wine, tobacco, and fruit are produced; and paper, silk, and soap are manufactured. Cap. Draguignan; chief town, Toulon. Pop. 324,000.

Varallo, tn., Piedmont, Italy, in prov. of and 32 m. N.W. of Novaro. The celebrated sanctuary of Sacre Monte is visited by many pilgrims. Pop. 4,200.

Varangians, or VARINGS, a name given by the Greeks and Slavs to the Northmen, or Scandinavian rovers, who in the 9th and 10th centuries sailed down the Dnieper and threatened Constantinople. The raids of the Varangians were stayed when Vladimir Christianized his subjects in 988. From the end of the 10th century till the capture of the city by the Turks in 1453 there was a bodyguard of Varangians at Constantinople. Warriors from England enlisted in it after the Norman conquest. See Scott's *Count Robert of Paris*.

Varanidæ. See MONITOR.

Varasdin, royal free city, Croatia, Hungary, cap. of the co. of same name, on the Drave, 30 m. N.N.E. of Agram. Pop. 13,000.

Varazze, seapt. of Italy, in Liguria, on the Gulf of Genoa, 18 m. s. by w. of Genoa. Pop. 9,800.

Varberg, tn. and wat.-pl., Halland gov., Sweden, on the Kattegat, 48 m. by rail s.s.e. of Gothenburg; exports timber, granite, butter, and fish. By a treaty made here in 1343 Valdemar Atterdag of Denmark ceded Skåne, Halland, and Blekinge to Sweden. Pop. (1911) 7,376.

Vardar (anc. *Axius*), riv., Turkey, rising in the s. of the vilayet of Kossovo, and flowing past Usküb and Köprili to the Gulf of Saloniki. Length, about 200 m.

Varde, tn., Denmark, on the Varde R., in the s.w. of Jutland, 76 m. w.s.w. of Aarhus. Pop. (1911) 4,816.

Vardö, tn., Norwegian co. Finmark, on island of same name, to the N. of Varanger Fjord, 137 m. e.s.e. of North Cape; exports fish, train-oil, and guano. Pop. 2,600.

Varel, tn., Oldenburg, Germany, near the mouth of the Jahde in the North Sea, 18 m. N. by w. of Oldenburg. Pop. (1910) 6,571.

Varennès, tn., dep. Meuse, France, 18 m. N.W. of Verdun; has manufactures of embroidery and tiles. On June 21, 1791, Louis XVI. and his family were captured here while trying to escape. Pop. 1,150.

Varese, tn. and autumn resort, Como prov., Lombardy, N. Italy, near Lake Varese, 30 m. N.W. of Milan; manufactures silk, leather, paper, and wine. Its church of St. Victor dates from the 7th century. Pop. 18,000.

Variable Stars are those which fluctuate in light to the extent of at least half a magnitude. They

may be divided into five classes:—

(1.) Temporary stars. (2.) Irregular variables, exhibiting changes amenable to no definite law. The typical example is γ Carinæ, now fully eight magnitudes fainter than at its maximum in 1843, but still marked by a bright-line spectrum analogous to those of 'new' stars. P Cygni is a similar though less extreme case. Other irregular stars, such as Betelguex, vary by less than a magnitude. (3.) Long-period variables, of which the best-known representative is Mira Ceti. About four hundred members of the class have been detected, their periods ranging between two years and about three months. Their spectra usually include bright lines, chiefly of hydrogen, near epochs of maximum, which recur with wide deviations from punctuality. (4.) Short-period variables, which are of three species, designated severally as Geminid, Cepheid, and Cluster variables. In Geminids, of which ξ Geminorum is the exemplar, the flow of light-change pursues a symmetrical curve, the times of increase and of decrease being equal. Some, notably β Lyræ, show two similar maxima, with intervening disparate minima. ν Vulpeculæ, notwithstanding its long period of seventy-five days, conforms to this type. Cepheid variables resemble δ Cephei in rising to maximum in about one-third of the complete cycle. Cluster variables lie dormant during the greater part of periods, commonly only a few hours in length, then increase swiftly by one or two magnitudes, and sink more slowly to datum level. They occur rarely as isolated objects, but with profusion in certain clusters and nebulae. Short-period variables in general are extremely exact in their modes of change, which appear to be prescribed by the revolutions

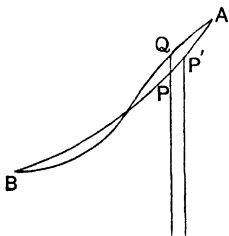
of companion bodies. (5.) Eclipsing stars are variable as a mere consequence of the geometrical relations of the systems formed by them. Their lustre would be constant if the planes of their revolutions were otherwise inclined. Some specimens, nevertheless, show phases so nearly continuous as to be scarcely distinguishable from those of fluctuating stars analogous to β Lyræ. Through comparisons of photographs taken at different epochs, crowds of variables have lately been discovered among faint stars. Thus the Harvard catalogue of 1907 contains 3,748 variables, of which 1,791 are situated in the Magellanic clouds.

Variation. (1.) In biology, any deviation from type, whether as regards structure or function, seen in plants or animals. As soon as Darwin demonstrated the possibility of evolution, variation became of supreme importance. There are two main modes of scientifically studying variation. The first is by taking a very large number of individuals of a particular species and investigating these in detail as regards one special character. This is known as the statistical or actuarial method of study, and has been pursued with great energy in Britain, where it is associated with the names of Galton, Pearson, and Weldon. The second (or experimental) method consists in the breeding of organisms on a large scale, the variations which appear in the course of the experiment being studied for successive generations. De Vries abroad, and Bateson in Great Britain, are the outstanding exponents of this school. A modification of this method is the study of fossils through a definite period of geological time. This has been specially done by American zoologists. The statistical

method seems to have definitely proved that if a single character be measured in a large number of individuals, it is possible to plot the results in the form of a curve, which is always of approximately symmetrical shape. It is from this fluctuating variability, as it has been called, that new species arise by the action of natural selection. On the other hand, experimental breeding has shown that, in addition to this fluctuating variability, in certain organisms at least, another type exists—the chance variations or mutations of De Vries. In this case the organisms do not form a graduated series, but certain forms differ strikingly from the others, and these striking variations are stated to be constant from generation to generation. If such variations pass the test of natural selection—i.e. if they are fitted to survive—they may give rise to new types (species) in a very much shorter time than the fluctuating variations. This method of study is intimately connected with the laws of heredity laid down by Mendel. See the journal *Biometrika* (1901, etc.), Bateson's *Study of Variation* (1894), De Vries's *Die Mutations-theorie* (1901-3) and *Species and Varieties* (1905), *Proc. (Section D) Brit. Assoc.* (1901 and 1904); also article HEREDITY. (2.) In music, a device in composition which consists in altering the melody or harmony of a simple theme so that at each repetition it appears in a new but still recognizable form. A theme and variations may be only a section of a work, as in sonatas, or may be an individual composition complete in itself, in which case the last variation is usually in the form of a more or less brilliant coda.

Variations, CALCULUS OF. The principles underlying this difficult branch of mathematics may be illustrated by the following

special case. Let there be two points not in the same vertical line, and let it be required to find the curve down which a body will slide in the least time. There must evidently be a curve down which the body will slide in a time that is at least not longer than the time down any other curve. Let APB represent this curve of shortest time—this brachistochronic path, as it is called—and let AQB be any neighbouring curve, Q being vertically above P. We can evidently pass



Calculus of Variations.

to the curve AQB from the curve APB by varying the height of each point. This is clearly a kind of differentiation (see CALCULUS); but it is not a differentiation of the usual kind, such as the variation in the height of P would be if the transition were to P', a neighbouring point on the same curve. Hence to distinguish it from differentiation along a curve we call it a variation from one curve to another. Now if APB is the path of shortest time, the quantity which expresses this time must be increased when we pass by variation to any neighbouring curve. The problem to be solved is then to find the form of the curve APB such that any change in the form will increase the time of sliding down it. The calculus of variations supplies methods for effecting the solu-

tion. Mathematically similar are the so-called isoperimetrical problems, of which the following may be taken as examples. To find the form of a curve of given length which will enclose the greatest area. The curve is the circle when no further conditions are given. But we may limit the positions of the ends of the given length of line in a great variety of ways (e.g. that they must lie on a particular curve or system of lines), and then the problem demands a new solution. Another class of isoperimetrical problem is that suggested by soap films, which always adjust their form so as to fulfil certain boundary conditions and have the area of film a minimum. See Woodhouse's *Isoperimetrical Problems* (1810), a most suggestive book; Jellett's *Calculus of Variations* (1850); and Todhunter's *History of the Calculus of Variations* (1861).

Varicella. See CHICKEN-POX.

Varicose Veins are veins increased in length, in calibre, and at first in the thickness of the vessel walls. In severe cases they become tortuous, knotted, and finally thin-walled. Almost any impediment to the circulation predisposes to varix, and occupations which necessitate prolonged standing are extremely conducive to the condition. The veins most apt to be affected are those of the lower limbs—those of the rectum producing hæmorrhoids, and those of the spermatic cord producing varicocele. In the leg the condition is most manifest in the superficial veins. Varicosity is apt to be progressive, and may be a source of grave danger. The subject of varicose veins should, if possible, be relieved from any occupation which necessitates the erect position for continued periods. Support should be given to the affected vein by elastic bandages or stockings. Varicocele may

be removed by a surgical operation, which is generally successful.

Variola. See SMALLPOX.

Varius, Lucius (c. 74-14 B.C.), a Roman poet of the Augustan age, a contemporary and friend of Horace and Virgil. Though he was considered one of the greatest poets of his time, scarcely anything is known of his life or his writings. He wrote epic poems, celebrating both Julius Cæsar and Augustus; and his tragedy, *Thyestes*, was called by Quintilian 'comparable to any Greek drama.' He was one of Virgil's literary executors, and revised the *Aeneid* before its publication.

Varley, Cornelius (1781-1873), English water-colour painter and inventor, brother of John and William Fleetwood Varley. He invented lenses and the graphic telescope (1811), exhibited at the Royal Academy (1803-59), was one of the founders of the Water-colour Society (1804), and wrote various scientific papers.

Varley, Cromwell Fleetwood (1828-83), English electrical engineer, son of Cornelius Varley. He invented a double-current key and relay (1854), and a cymphen, an instrument resembling the telephone (1870). After the failure of the first Atlantic cable (1858), Varley contributed greatly to the success of the second.

Varley, John (1778-1842), English water-colour painter, born at Hackney, London. He first exhibited at the Royal Academy, but in 1804 he became a foundation member of the Water-colour Society. As a teacher he was peculiarly successful; he counted W. H. Hunt and Linnell among his pupils. His composition was masterly, and his best work has great freshness and breadth. Examples of his drawings are in the National and the Tate Gallery, London, and in S. Kensington Museum.

Varna, fort. seapt. tn., Bulgaria, on Black Sea, 300 m. E.N.E. of Sofia; seat of a Greek and a Bulgarian metropolitan. It exports cattle, butter, skins, and grain. Other products include wine, leather, and cloth. The total trade is valued at over one million sterling. Here (Nov. 10, 1444) Ladislaus, king of Hungary and Poland, was defeated and slain by the Turks. Pop. (1910) 41,317.

Varnhagen von Ense, Karl August (1785-1858), German author, was born at Düsseldorf; served in the Austrian army against Napoleon (1809); joined the Russian army (1813); subsequently did valuable work at Carlsruhe, and later at Berlin, in the Prussian diplomatic service. It is as a biographer that he was most successful. Among his works are *Deutsche Erzählungen* (1815); *Goethe in den Zeugnissen der Mitlebenden* (1823); *Biographische Denkmale* (1824-30; later ed. 1872); and *Karl Müller's Leben und Kleine Schriften* (1847). The letters addressed to him by A. von Humboldt (1860) and Carlyle (1892) have also been published.

Varnhagen von Ense, Rahel Antonie Friederike (1771-1832), wife of the preceding, was a Christianized Jewess (*née* Levin). Her remarkable gifts made her a power in Berlin literary circles. Her literary remains were published in 1833 and 1836, and some of her correspondence in 1861 and 1874-5. See Schmidt-Weissenfels's *Rahel und ihre Zeit* (1857), and L. Assing's *Aus Rahels Herzensleben* (1877).

Varnishes, solutions of gums or resins used to produce a hard, shining, protective surface on various articles. The drying oils, such as linseed oil, are natural varnishes, the drying power being increased by various processes, such as boiling. If a resinous substance is dissolved by heat in

the drying oil, more hardness is given to the varnish, but this addition necessitates diluting the varnish with oil of turpentine. Varnishes which consist of resinous material dissolved in oil of turpentine are often called 'crystal varnishes,' and are used chiefly for varnishing maps. For 'spirit varnishes' ordinary methylated spirit is generally used, but absolute alcohol is preferable. In making spirit varnishes the resinous material is placed in a bottle, together with about its own bulk of clean and dry flint stones or broken glass. The spirit is poured in and the bottle shaken occasionally until solution is complete, when the varnish is filtered. The uses to which varnishes are put frequently suggest their names, as 'carriage,' 'paper,' 'patent-leather,' 'photographic,' etc., varnishes. Black varnishes made with asphaltum are known as *japans*.

Varnish Tree, a name sometimes given to *Ailantus glandulosa*, the tree of heaven, a native of China; also applied to *Rhus vernicifera* and other trees.

Varro. (1.) GAIUS TERENTIUS VARRO was consul at ancient Rome in 216 B.C., when he fought the disastrous battle of Cannæ against Hannibal. He afterwards acted on embassies to Philip of Macedon in 203, and Syphax, king in Numidia, in 200 B.C. (2.) MARCUS TERENTIUS VARRO (116-28 B.C.), the most famous of the Romans for learning, was born at Reate. He was pro-prætor under Pompey in his war against the pirates; after Pharsalia he surrendered to Cæsar, who made him superintendent of the public library which he was preparing. His most important works were satires, mock tragedies, poems, and *Antiquitates rerum Humanarum et Divinarum*, the last much used by Augustine in *De Civitate Dei*. Other books were *Imagines*

(or portraits) of 700 Greek and Roman celebrities; *Disciplina*, a sort of encyclopædia of the liberal arts; *De Lingua Latina*, mutilated; and *De Re Rustica*, almost entire. His style is vigorous, though often stiff and abrupt, and lacking in finish. There is an edition of *De Re Rustica* by Keil (1891), of *De Lingua Latina* by Spengel (1885), and of the fragments by Brunetti (1874).

Varuna, a term originally used in Vedic literature to express the firmament. Subsequently Hinduism deified Varuna as sovereign of all waters.

Varus. (1.) PUBLIUS ATIUS VARUS, one of Pompey's generals in the civil war against Cæsar. When Pompey left Italy in 49 B.C., Varus crossed to Africa, there raised troops, and, with the assistance of Juba, destroyed Curio's army. After Pharsalia, in 48, Varus had to resign the command in Africa to Scipio; and after the defeat of the Pompeians in Africa at Thapsus, he joined Pompey's sons in Spain, and fell at the battle of Munda (45). (2.) PUBLIUS QUINTILIUS VARUS was consul at Rome in 13 B.C.; afterwards governor of Syria, and about 7 A.D. was made governor of Germany. His ill-considered measures led to a revolt of the Germans under Arminius, and being entrapped in the Teutoburger Forest, after three days of fighting and heavy losses, his legions were annihilated (9 A.D.) and Varus killed himself.

Vasa. See NIKOLAISTAD.

Vasa, GUSTAVUS. See GUSTAVUS I.

Vásárhely. See MAROS VÁSÁRHELY.

Vásárhely Hodmező. See HÓD-MEZŐ-VÁSÁRHELY.

Vasari, GIORGIO (1511-74), Italian art historian, architect, and painter, was born at Arezzo; commissioned by Duke Cosimo

the Great (1553) to execute numerous works of art at Florence. Examples of his painting at Rome, Bologna, Arezzo, and Rimini are not altogether pleasing; but specimens of his architecture at Rome, Florence, Arezzo, Pistoja, and Pisa testify to brilliant gifts. However, Vasari's fame rests chiefly on the *Vite de' più eccellenti Pittori, Scultori, e Architetti* (1550; 2nd ed., greatly improved, 1568; the best of the subsequent editions is that of Milanesi, 9 vols., 1878-85). This work is the basis of Italian art history, and can never lose its value. The best English version is still that of Mrs. J. Foster (in Bohn's Library), with the commentary of J. P. Richter. See *Life* by R. W. Carden (1910).

Vasco da Gama. See GAMA.

Vasconcellos, JOAQUIM ANTONIO DA FONSECA (1849), Portuguese critic, born at Oporto; became (1883) professor of German at the Lyceum there, and has published *Portuguese Musicians* (1870), *Goethe's 'Faust,' and Castilho's Translation* (1872), *Albert Dürer and his Influence* (1879), and *Goësiana* (1879-97).

Vascular System, in animals. Among the lower invertebrates there is no differentiated vascular system, the tissues merely being bathed in a nutritious fluid, which is replenished by the material ingested by the general surface of the body. As evolution proceeds, arrangements are made whereby the nourishment is taken into and digested by a special tube—the alimentary tract—and coincidentally with this there is a more highly specialized distributary system. This takes the form of a central organ (the heart), which pumps the nutritious fluid through a series of tubes (arteries) which convey the aerated blood to the tissues, and another series of tubes (veins) which carry the venous blood back to the right

side of the heart, from whence it is sent to the lungs to be aerated again. A further account of this system is given under CIRCULATION.

Vascular System, in plants. In flowering plants, and also in certain flowerless plants belonging to the sections of the ferns and club mosses known as vascular cryptogams, fluids containing nourishment are largely distributed to all parts of the plant by means of certain tubes collected in bundles, known as fibro-vascular bundles. In monocotyledonous plants the fibro-vascular bundle consists of xylem and phloëm only, and are known as 'closed' bundles. In dicotyledons, between the xylem and phloëm is a layer of actively growing meristematic cells forming the cambium; the bundle is then said to be 'open.' Each year the cambium gives rise to a new layer of xylem to its outer side and of phloëm to its inner side, thus giving rise to the annular rings by means of which the age of a tree can be estimated. See WOOD.

Vaseline, soft paraffin, or petroleum jelly, is the pasty mixture of hydrocarbons left on the distillation of American petroleum or of ozokerite; an inferior product is made by dissolving solid paraffins in heavy oils. It is purified mainly by filtration through animal charcoal. It is odourless and semi-solid, melts at from 40° to 50° C., and is insoluble in water, but dissolves freely in benzene, turpentine, etc. It is but slightly acted on by acids or alkalis, and does not turn rancid. It is largely used as a lubricant, as a protective for polished iron, etc., and in pharmacy as an unguent and a basis for ointments.

Vases, the more elegant species of glazed or enamelled earthenware manufactured by the an-

cient Assyrians, Egyptians, Romans, Etruscans, and Greeks, as well as by mediæval artists. Greek painted vases belong to a period between 700 and 200 B.C. The art appears to have been lost for many centuries, as it is only in the 11th century that the white-glazed vases of the European continent become conspicuous. See POTTERY, GLASS, and PORTLAND VASE.

Vasilkov, tn., Kiev gov., S.W. Russia, 24 m. s.s.w. of Kiev city; with breweries, brick works, and manufacture of tobacco, candles, and soap. Pop. 18,000.

Vaslui, tn., Roumania, in Moldavia, on the riv. Berlad, 40 m. s. by E. of Jassy. Pop. 9,000.

Vassilkov. See VASILKOV.

Vasto (anc. *Histonium*), tn., Chieti prov., Abruzzi e Molise, Italy, near Adriatic, 30 m. E.S.E. of Chieti; has manufactures of silk, wine, wax candles, and bricks. Olives are cultivated largely. Pop. 16,000.

Vatersay, or WATERSAY, isl. of the Outer Hebrides, Scotland, in co. of Inverness, close to Barra. It came prominently before the public in 1909, in connection with the crofter agitation. Crofters took forcible possession of the island, and refused to leave it. The matter was frequently discussed in Parliament, and eventually the island was purchased early in 1910 by the government, at the price of £6,000, for the benefit of the crofters in possession.

Vatican, the palace of the popes at Rome, stands on the N. side of the Tiber, in what is known as the Leonine city. Its original nucleus seems to have been a house built in the time of Constantine, rebuilt by Pope Innocent III. about 1200, and enlarged by Nicholas III. (1277-80). The popes did not habitually occupy it, however, until after the return from Avignon (1377). The palace was almost entirely

rebuilt on a much grander scale from 1447. Only a relatively small portion of the existing vast complex is inhabited by the pope. The rest includes the Sistine Chapel (1473 onwards), decorated with paintings by the chief artists of the Florentine and Umbrian schools in 1481-3, while the ceiling exhibits some of the grandest work done (1508-12) by Michael Angelo, and his *Last Judgment* (1534-41) adorns the altar; Raphael's stanze (1508-20)—that is, frescoes in the state rooms, and loggie or arcades, in great part actually executed by his pupils; the picture gallery, containing pictures by Leonardo da Vinci, Raphael, Fra Angelico, Domenichino, Titian, Perugino, and others; the chapel of Nicholas v., adorned with frescoes (1450-5) by Fra Angelico; 'Raphael's carpets,' for which he drew the designs in 1515-16; the Borgian apartments, with frescoes by Pinturicchio and others; the Pius-Clementine Museum, containing famous sculptures of ancient Greece, including the Laocoon group and the Apollo Belvedere; the Chiaramonti Museum, also antique sculptures; the Braccio Nuovo, containing portraits, statues, and busts, Greek and Roman; the Egyptian Museum; the Etruscan Museum, founded by Gregory XVI. in 1836, of especial value; the Museum of Christian Antiquities, containing many objects from the catacombs and many ancient ecclesiastical and liturgical articles; and the library, containing nearly 30,000 mss. See Sladen's *Secrets of the Vatican* (1907).

Vatican Council. This council was summoned to proclaim the infallibility of the pope. It met on Dec. 8, 1869, and, being adjourned, reassembled on July 18, 1870. The Ultramontanes triumphed after a keen debate,

the 'Old Catholics' alone finally dissenting from the dogma, and repudiating the general character of the council. See Gladstone's *Vatican Decrees* (1874), Manning's *True Story of the Vatican Council* (1877), and *Cambridge Modern History*, vol. xi. ch. 25 (1909).

Vatinius, **PUBLIUS**, a Roman who was quaestor in 63, and in 59 as tribune greatly assisted Caesar in his democratic legislation. In 55 he was praetor; he served under Caesar in the civil war, and was made consul in 47. In 46 he carried on war successfully in Illyricum against the Pompeian forces, but early in 43 had to surrender Dyrrachium and his army to Brutus. Cicero delivered orations against him and for him; the former is extant.

Vatke, **WILHELM** (1806-82), German theologian and critic, born at Behndorf, near Magdeburg; became professor of theology at Berlin (1837). He was one of the earliest of the Old Testament critics to elucidate the theory of the post-exilic origin of the priestly code in the Pentateuch, which has been elaborated by Kuenen and Wellhausen. His principal works were *Die Religion des Alten Testaments* (1835), *Historisch-kritische Einleitung in das Alte Testament* (1886), and *Religions-Philosophie* (1888).

Vatna - Jökull, or **KLOFA-JÖKULL**, a volcanic mt. in S.E. Iceland, rising to nearly 6,000 ft. It was active in 1389 and 1753.

Vattel, **EMERIC DE** (1714-67), Swiss jurist, born near Neuchâtel. Entering the state service of Saxony, he was sent to Bern as minister of the elector. Among his chief works are *Loisirs Philosophiques* (1747); *Mélanges de Littérature, de Morale et de Politique* (1757); and his masterpiece, *Droit des Gens, ou Principes de la Loi Naturelle* (1758). His final work was *Cours de Droit Naturel* (1862).

Vauban, **SÉBASTIEN LE PRÉSTRE DE** (1633-1707), marshal of France, born at Saint-Léger de Foucher in Burgundy. He entered the army of Condé in the Spanish service, and distinguished himself by his daring and his knowledge of military engineering. Taken prisoner by the French, he was induced by Mazarin to serve their country. His life was passed mainly in making and besieging fortresses. He also directed or reported on operations connected with harbours and inland navigation. He was created a marshal of France (1703). He wrote *Traité de l'Attaque et de la Défense des Places* (1739), *Essai sur les Fortifications* (1739), and *Traité des Sièges* (1747); also *Mémoires Inédits sur Landau et Luxembourg* (1841), *Oisivetés de M. de Vauban* (1843-6), *Projet d'une Dîme Royale* (1707), which was condemned by Parliament, and procured its author's disgrace. See Michel's *Histoire de Vauban* (1879).

Vaucluse, dep. of S.E. France, between dep. Drôme on N. and dep. Bouches-du-Rhône on S.; covers an area of 1,381 sq. m., and is watered by tributaries of the Rhone and Durance. The culminating point is Mt. Ventoux (6,310 ft.). Agriculture is the chief industry; wine is produced; and linen goods, silk, pottery, paper, and chemicals are manufactured. Coal, sulphur, and gypsum occur in the department, which also contains remarkable archæological remains. The capital is Avignon. Petrarch lived for sixteen years at Vaucluse, composing many of his finest poems to Laura, and writing or beginning most of his other works. Pop. 239,000.

Vaud (Ger. *Waadt*), Swiss canton, with an area of 1,244 sq. m. and pop. (1910) 315,428, mainly French-speaking and Protestant. It did not become a full canton

till 1803. It includes all the N. shore of the Lake of Geneva, and extends from the French frontier in the Jura to the Bernese Oberland. The highest point is the Diablerets (10,650 ft.). Its chief product is wine, and its capital is Lausanne. Other places of interest are Avenches and Chillon.

Vaudeville, a minor song of a gay order, suitable to be carolled to a popular air. Street songs and musical quips come under this category. In drama the vaudeville is something light and amusing, or of the nature of comic opera. Olivier Basselin, in the 15th century, originated the word, by which he described his songs composed in the valley of the Vire.

Vaudois. See WALDENSES.

Vaughan, HENRY (1622-95), the 'Silurist,' Welsh poet, was born at Llansaintfræd, Brecknockshire, in the ancient territory of the Silures. His twin-brother, Thomas (1622-65), became known as an alchemist under the name of Eugenius Philalethes. Henry studied law, and settled down as a physician at Brecon. As a young man he had written secular verse after the style of Donne and Ben Jonson; in his later years he wrote religious verse in that of George Herbert. His works include *Poems* (1646); *Silex Scintillans* (1650; ed. Bettany, 1905); *Thalia Rediviva* (1678); *Sacred Poems* (ed. H. F. Lyte, 1847); *Collected Poems* (ed. E. K. Chambers, 1896, and E. Hutton, 1904); and in prose, *Mount of Olives* (1652); *Flores Solitudinis* (1654); *Hermetical Physio* (1655); *Collected Works* (ed. A. B. Grosart, 1871); *Selections* (ed. W. R. Nicoll; ed. J. R. Tuin, 1823).

Vaughan, HERBERT (1832-1903), cardinal, Roman Catholic archbishop of Westminster, was born at Gloucester. He was bishop of Salford from 1872 to 1892, when

he was promoted to the archiepiscopal see. The principal event of his occupancy of the chair was the erection of the cathedral at Westminster. He was Ultramontane in his views. See *Life* by J. G. Snead-Cox (1910).

Vaughan, ROBERT (1795-1868), Welsh Congregationalist divine; became minister of Worcester (1819); Hornton Street, Kensington (1825); professor of history at University College, London (1834); and president and professor of theology, Lancashire Independent College (1843). He founded the *British Quarterly* (1845), and wrote *Life and Opinions of John de Wycliffe* (1828), and *Revolutions in English History* (1859-63). See *Robert Vaughan: a Memorial* (1869).

Vault, an arched ceiling or roof, composed of brick or other material resisting compression, the stress produced being supported by abutments. A vault in cross section may follow any form of the arch, and is termed a barrel (semicircular) or tunnel vault when continuous without intersections. Vaulting was not used in important buildings till Roman times, but passages six feet wide covered with barrel vaults, built in crude brick, were discovered by Professor Flinders Petrie at Dendera in Egypt, dating from 3500 B.C. The mitres or intersections of vaults are termed groins, which in a barrel vault take the form of an ellipse, a difficult construction. The further difficulty of intersecting vaults of different spans gave rise to the common use of the Pointed arch form and the groined rib; the spandrels, web, or shell of the vault was then built of tufa, or other light stone, between the ribs, and supported by them. In the Pointed style the development of the ribbed vault is important, and is distinguished as hexapartite, quadripartite, fan

tracery, etc. Vaults may also be in the form of a dome or a cone, the latter being used when a load has to be supported on the top conveying the thrust direct to the supports, as inside the timber dome of St. Paul's.

Vauvenargues, LUC DE CLAPIERS, MARQUIS DE (1715-47), French philosopher, born at Aix in Provence; served in the Italian campaign (1733-6) and that in Bohemia (1741-3), after which he turned his attention to literature, making Paris his residence, and becoming the friend of Mirabeau, Voltaire, and Marmontel. He achieved immediate fame with his first book, *Introduction à la Connaissance de l'Esprit Humain* (1746). His *Œuvres Complètes* have been edited by Gilbert (1857) and by Plon (1874). See Paléologue's *Vauvenargues* (1890).

Vauxhall, a once famous and fashionable public garden at Lambeth, London, was opened in 1690, and existed till 1859.

Vauxhall Bridge was built by the London County Council, and opened in May 1906. The total length between the abutments is 759 ft. 4 in.; the total waterway 699 ft. 4 in.; the central span 149 ft. 7 in., with a headway of 20 ft. above high water. The extreme net width of bridge between parapets is 80 ft., the width of roadway being 50 ft.

Vavasour, or VAVASSOR, a feudal term indicating a chief vassal, holding not immediately from the lord paramount, but from a principal lord, and having other vassals who held from him.

Vavau, a group of the Tonga Is., S. Pacific.

V.C., Victoria Cross; Vice-chancellor; Vice-consul.

Vecellio. See TITIAN.

Vector, in mathematics, the name given to any quantity which involves direction as well as magnitude. The simplest ex-

ample is the position of one point with respect to another, obviously fully represented by the straight line joining them. Other vector quantities are velocity, force, moment of force, angular momentum, electric induction, and magnetic induction. Each of these can be represented by a straight line of appropriate length and suitable direction. Hamilton's quaternions contain one system of vector algebra suitable for applications in geometry, dynamics, and electric theory. The methods there developed have been introduced by later writers in variously modified forms. See VECTOR ANALYSIS.

Vector Analysis, a branch of mathematics of increasing importance, in which the properties of vectors are investigated directly, without resort to Cartesian systems of co-ordinates. Many branches of mathematics can be treated with advantage in this way, but the especial application is to physical problems, where the method generally gives results with a much greater clearness and simplicity than the old system of resolving each vector into three components to be treated separately. In electromagnetic theory, following the example of Heaviside, all the leading physicists now make use of the methods of vector analysis, the vectors involved being such things as electric displacement, magnetic force, etc.

The method had its origin in Hamilton's quaternions, but the modern analysis is simpler and more direct. Of fundamental importance are the scalar product and the vector product of two vectors. The scalar product is a scalar quantity given by the product of the magnitudes of the two vectors and the cosine of the angle between their directions. Thus the scalar product of the path of a particle and the force

acting upon it is the work done. The vector product of two vectors is a vector whose direction is perpendicular to the plane containing the two vectors, and whose magnitude is equal to the area of the completed parallelogram given by the vectors. Thus the vector product of radius into angular velocity gives the linear velocity of a point.

There are many excellent textbooks in German on the subject. A good introduction can be found in Abraham and Föpl's *Theorie der Electricität*, vol. i. (1907), or Bucherer's *Element der Vektor Analysis* (1905). See Henrici's *Vectors and Rotors* (1903); Wilson and Gibb's *Vector Analysis* (1901); and, for electro-magnetic applications, Heaviside's *Electrical Papers* (1892).

Vector Product. See VECTOR ANALYSIS.

Vedanta, or UTTARA-MIMAMSA, or UPANISHAD, a system of Vedic or ancient Hindu philosophy, the object of which is an inquiry into the true nature of the human soul. Amongst its conclusions are these: that the individuality of the soul is only an illusion (*maya*), and its seeming experience is fictitious; that there is but one reality—the supreme spirit; that redemption from the manifold pains of the unending succession of states of existence imposed by metempsychosis is to be won by ‘purified’ knowledge and by the reunion of the impersonal soul with the supreme spirit (Brahman). Its most famous interpreters were Sankara-Acharya, who lived in the 9th century A.D., and Ramanuja, of the 12th century. See Deussen's *Die Sutras des Vedanta* (1887) and the English trans. by G. Thibaut in vols. xxxiv. xxxviii., and xlviii. (1892-1904) of *Sacred Books of the East*.

Vedas, the oldest sacred literature of the Hindus, are written

in Sanskrit, and are supposed to have been composed by a succession of poets from about 1500 to 1000 B.C. They are divided into four parts—*Rig-Veda*, *Yajur-Veda*, *Sâma-Veda*, and *Atharva-Veda*. Of these the stateliest, and probably the oldest, is the *Rig-Veda*, songs in praise of personified elements, and from it the other three appear to have largely borrowed. The *Yajur-Veda* are sacrificial prayers; the *Sâma-Veda*, hymns and tunes sung at the Soma sacrificial rites; and the *Atharva-Veda*, undoubtedly the most modern, contains incantations to be used against the powers of evil. These poems embody the earliest religious conceptions of the Hindus, and throw some light on the ancient history and social condition of the Indo-Aryan race. See SANSKRIT LANGUAGE AND LITERATURE; also Arnold's *Vedic Metre* (1905).

Veddahs, a tribe of Ceylon, the last survivors of the aborigines, representing the Yakkos of Sanskrit writings; with very long and high skull, long shaggy black hair, low stature (mean, 5 ft. 2 in.), and dark-brown colour, but features in other respects somewhat regular. They all speak a pure Sinhalese dialect, unaffected by Sanskrit or Pali elements. They number about 4,000. See C. G. and B. Z. Seligmann's *The Veddahs* (1911).

Vedder, ELIHU (1836), American painter, born in New York city, but has made Rome his residence. Among his best-known paintings are *The Greek Actor's Daughter*, *Roman Girls on the Seashore*, *Venetians on the Main*, *The Lair of the Sea Serpent*, and *The Crucifixion*. His illustrations of Fitzgerald's *Omar Khayyam* (1884) gained him world-wide renown. The beautiful mosaic Minerva and five decorative panels in the new Congressional Library at Washington are his work.

Vedism, a term applied, in Hindu literature, to the revelations communicated by a self-existent Being to certain holy men (called Rishis) for the instruction of mankind. The Vedas are the written expression of these utterances. Vedism, from which sprang Brahmanism, and through it Hinduism, was the earliest faith of the Hindu Aryan.

Veen, MAERTEN VAN. See HEEMSKERK.

Veendam, comm., Netherlands, in prov. and 16 m. S.E. of Groningen. Manufactures calico, and has boat-building. Pop. (1910) 12,195.

Veenendal, comm., Netherlands, prov. of and 23 m. E. by S. of Utrecht. Pop. (1910) 6,015.

Vega (α Lyrae), a Sirian star which will be the pole star of the 15th and 16th millenniums A.D., as it was of the 12th and 13th B.C. Vega has a parallax of '082", equivalent to a light-journey of nearly forty years. It is of ninety-two times the solar brilliancy. It is approaching the sun with the velocity of 10 miles a second.

Vega, GARCILASO DE LA (1503-36), Spanish poet, and favourite of the Emperor Charles V., in whose wars he fought all his life. He was killed in the storming of Mui. Much of his time was passed in Italy, and with his friend Boscan he introduced into Spanish poetry the new note of the Italian renaissance. He was the first to popularize the Italian sonnet in Spain, and the first to write an ode in Spanish. Garcilaso's poetry was translated into English by J. H. Wiffen (1823). The first Spanish edition (with Boscan's poems included) was in 1543. See Croce's *Garcilaso de la Vega in Italia* (1894).

Vega, GARCILASO INCA DE LA (1540-1616), historian of Peru, born at Cuzco. He went to Spain (1560), and served in the Spanish army; but afterwards settled in

Cordova, where he devoted himself to historical writing, producing, among other works, *El Florida del Inca* (1605), a vivid and accurate description of De Soto's expedition to Florida; and *Historia General del Perú* (1609-16; Eng. trans. 1869).

Vega Carpio, LOPE FELIX DE. See LOPE.

Vegetable Ivory. See IVORY.

Vegetable Marrow (*Cucurbita Pepo ovifera*), an annual trailing plant of the gourd order, largely grown in Britain for its fruits, which are eaten as a vegetable, and are also used in the form of sweet preserves.

Vegetable Physiology. See PLANTS, PHYSIOLOGY OF.

Vegetarianism. Of vegetarians, some reject all animal foods (even eggs, milk, and butter); others abstain only from foods whose production involves the destruction of living animals; while a third group consists of those who allow themselves such foods as are procurable without unnecessary suffering or pain—e.g. net-caught fish. See FOOD AND FEEDING.

Veghel, comm. in North Brabant prov., Netherlands, 11 m. S.E. of 'sHertogenbosch. Pop. (1910) 6,116.

Veglia, isl. in the Gulf of Quarnero, Adriatic Sea, forming part of the Austrian crown-land of Istria. It is separated from Croatia by the narrow channel of Morlacca, and is 8 m. S.E. of Fiume. Wine, oil, grain, and silk are produced, and there are important fisheries. The chief town on the island is Veglia, the capital. Pop. (1911) isl., 21,286; tn. 2,203.

Vehmgericht, or FEMGERICHT, an institution of justice, of which a one-sided view is generally held, based on Scott's *Anne of Geierstein*. In its later days the tribunal became subject to many abuses, but in its origin it

was a free, popular, public court of justice, which continued old German ideas of popular law and custom. It was in no sense a secret society, although it might, and sometimes did, hold secret sittings. The judicial procedure was exactly the same as in ordinary courts, except that torture was not used. On conviction, however, punishment was summary, and a dagger marked with the letters S.S.G.G. (supposed to stand for words meaning rope, stone, grass, green), was left beside the body, that there might be no mistake as to the cause of death. The jurisdiction of the tribunal at one time extended far beyond Westphalia, and princes and nobles found it convenient to become *Schöffen* (members). It was finally abolished by Jerome Bonaparte in 1811. See Wigand's *Das Femgericht Westphalens* (ed. 1893), and Lindner's *Die Feme* (1887).

Veii, an ancient Etruscan city, situated 12 m. N.W. of Rome. It was one of the twelve cities of the Etruscan confederacy. Frequent wars were waged by Rome with Veii during three and a half centuries, and ended in the capture of Veii by Camillus in 396 B.C., after a siege said to have lasted ten years. When the Gauls captured Rome in 390, the Romans took shelter at Veii. See Dennis's *Cities and Cemeteries of Etruria* (1878).

Veiled Prophet. See AL-HAKIM-IBN-OTTO.

Veins, in anatomy, are elastic tubes by which blood is borne from the periphery towards the heart. They are distinguished as systemic, pulmonary, or portal. Pulmonary veins carry oxygenated blood from the lungs; systemic veins carry venous blood from the tissues; the portal vein conveys blood laden with food products from the alimentary canal to the liver, in which it

ramifies like an artery. In structure a vein resembles an artery in having three coats, but its walls are thinner and less elastic. Venous blood-pressure is comparatively low, and the current is continuous, no pulse being present except under abnormal conditions. For diseases of veins see PHLEBITIS, THROMBOSIS, VARICOSE VEINS and VESSELS, DISEASES OF.

Veins, in geology. See DYKES, LODES.

Veit, PHILIPP (1793-1877), German painter, born in Berlin. He studied art in Rome, and became director of the Städel Institute at Frankfurt-on-Main (1830) and of the museum at Mainz (1853). Among his works are *The Two Maries at the Sepulchre*, *The Assumption*, *The Good Samaritan*, *Christianity bringing the Fine Arts to Germany*, and *The Glorification of the Christian Faith* (for the cathedral of Berlin).

Veitch, JOHN (1829-94), Scottish philosopher and historian, was born at Peebles. He was assistant to Sir William Hamilton (1856) and Professor Fraser (1856-60), himself becoming professor of logic and rhetoric at St. Andrews (1860) and at Glasgow (1864). His most notable works are *The History and Poetry of the Scottish Border* (1893) and *The Feeling for Nature in Scottish Poetry* (1887).

Veitch, WILLIAM (1794-1885), Scottish scholar, born at Spittal-on-Rule in Roxburghshire. He became a licentiate of the Church of Scotland, but ultimately devoted himself to study and tuition. He was a man of rare scholarship and a famous raconteur. He published Cicero's *De Natura Deorum*; *Greek Verbs, Irregular and Defective* (1848); assisted Liddell and Scott with the *Greek Lexicon*.

Vejer de la Frontera, tn., Spain, in prov. of and 30 m. S.E. of Cadiz. Pop. 11,000.

Vejle, tn., Denmark, in Jutland, at the head of Vejle Fjord, 40 m. s.w. of Aarhus; has breweries, distilleries, tanneries, and tobacco factories. Pop. (1911) 17,261.

Velasquez, **DIEGO** (?1465-1523), Spanish soldier of fortune, surnamed 'the Conquistador,' accompanied Columbus on his second voyage (1493), and was employed by the king of Spain and by Columbus. In 1514 he brought Cuba under subjection. He then became governor of the new territory, and sent Cortes to conquer Mexico.

Velazquez, **DIEGO RODRIGUEZ DE SILVA Y** (1599 - 1660), the greatest of Spanish painters and one of the greatest of all painters, was the representative in art of the dignified, aristocratic national types, just as Murillo is less individual, more cosmopolitan by reason of his more democratic birth and associations. Born in Seville, Velazquez studied under Herrera, then under Pacheco, whose daughter he married, and at whose house he met Cervantes and other notabilities. In 1623 Olivares, the great minister, invited him to Madrid, and persuaded the king to sit for his portrait. Velazquez then became the favourite of Philip IV.; was elected court painter, and held various offices at court. His position there freed him from the supervision of the church and from warnings by the Inquisition. The immunity from the necessity of painting religious subjects is one of the several causes that led to his essentially modern development—a modernity fully appreciated and understood since the 19th century only. In his own country his influence was not wide; but he has become the dominating influence of schools of French, English, and American artists of to-day. In 1623 Charles I. of England, then

Prince of Wales, sat to him. In 1630, by the advice of Rubens, he visited Italy, and in Venice he studied Tintoretto. In 1648 he again went to Italy, commissioned by Philip to buy pictures in order to form a Spanish academy. Whilst in Rome he painted the magnificent portrait of Innocent X. On his return he was made marshal of the court. It was in fulfilment of this office during the conference at Irun, on the 'Island of Pheasants,' that he caught his death-fever. A superb colourist and admirable draughtsman, he selected the salient characteristics of the person or scene, and eliminated all non-essentials. His favourite scheme of cool grays doubtless grew out of familiarity with and appreciation of the large cool rooms, with their quiet shadows, of the palace where so much of his work was done. To know Velazquez properly he must be studied in Madrid; but fine examples are to be seen elsewhere, especially at Vienna, and in the National Gallery, London, for which his *Venus with a Mirror*, formerly in the Rokeby Collection, was acquired in 1906 for £45,000. See R. A. M. Stevenson's *Velasquez* (1899), Sir W. Stirling-Maxwell's *Velasquez and his Works* (1855), Charles B. Curtis's *Velasquez and Murillo* (1883), Beruete's *Velasquez* (1906), Calvert and Hartley's *Velasquez* (1908), and C. Justi's *Diego Velazquez and his Times* (1889).

Velbert, tn. of Rhenish Prussia, in dist. of Düsseldorf, 7 m. n.w. of Barmen. Has manufactures of hardware, foundries, etc. Iron ore is mined in the vicinity. Pop. (1910) 23,127.

Velde. See VAN DE VELDE.

Veldes, summer resort, Carniola, Austria, 30 m. n.w. of Laibach; with mineral spring and sun baths. Pop. 1,600.

Veles. See KÖPRÜLÜ.

Velez, tn., Colombia, 65 m. N.E. of Bogotá. Pop. 15,000.

Velez Blanco, tn., Spain, in prov. of and 60 m. N.N.E. of Almeria. It has oil mills, and manufactures textiles and soap. On a height overlooking the town is an old Moorish castle. Pop. 6,800.

Velez de Guevara. See GUEVARA.

Velez Malaga, city, prov. Malaga, Spain, 15 m. E.N.E. of Malaga. Produces raisins, olive oil, and sugar. Pop. 24,000.

Velez Rubio, tn., prov. Almeria, Spain, 54 m. N.N.E. of Almeria, in Sierra Maria Mts., on an eminence overlooking a lovely valley. Pop. 10,000.

Velia, in Greek HYELE or ELEA, a Phocæan colony on the W. coast of Italy, in ancient Lucania, founded c. 540 B.C. It became an ally of Rome in the 3rd century B.C. Under the empire it declined; about 800 A.D. the Saracens completed its ruin. It was famous for the Eleatic school of philosophy, founded by Xenophanes of Colophon, who settled there, and continued by Parmenides and Zeno, natives of Elea.

Velij, tn., Vitebsk gov., W. Russia, 49 m. N.E. of Vitebsk city, on W. Dwina (Düna); with a castle built by Ivan the Terrible in 1536. It is a river-port, and has various industries. Pop. 12,500.

Velleius, PATERCULUS. See PATERCULUS.

Velletri (anc. *Velitra*), tn. and episc. see, prov. Rome, Latium, Italy, at S.E. foot of Monti Albani, 22 m. S.E. of Rome; produces wine. Here Garibaldi won a victory over the king of Naples, May 19, 1849. The cathedral of San Clemente dates from the 17th century. Pop. 19,000.

Vellore, munic. tn. and military station, N. Arcot dist., Madras Presidency, India, 80 m. S.W. of Madras. It was defended by the

British against Haidar Ali in 1780-2. In 1806 the Sepoy soldiers at Vellore mutinied, and massacred the European officers and residents. Pop. 44,000.

Vellozia, a genus of tropical woody-stem plants belonging to the order Amaryllidaceæ. They are mostly natives of S. Africa and Brazil. The leaves grow in clusters at the tips of the branches, and the showy campanulate flowers are borne singly.

Vellum. See PARCHMENT.

Velocity is primarily the rate of change of position of a moving point, but it is also applied to the rate at which a state or configuration passes along among particles. It is a vector quantity, and is completely specified when the direction of motion is given as well as the speed or rate at which space is being described. The speed or amount of velocity is measured by dividing the length passed over in a short time by the time taken. The unit of velocity is that velocity with which a point will pass over unit length in unit time—e.g. a foot per second, a mile per hour. The relative velocities to which we are accustomed at the earth's surface are comparatively small, rarely exceeding half a mile a second. The earth's equatorial regions rotate about the axis with a speed of fully a thousand miles an hour—not quite a quarter of a mile a second. The earth's own speed in its orbit is about 18 m. a second. But outside the earth we have in the motions of other cosmical bodies examples of much greater velocities, such as 50 or 100 m. a second. As regards the velocity of states, we have the various speeds of propagation of water waves, the velocity of sound waves through air (1,000 ft. per second), and of earthquake vibrations through the earth (7 or 8 m. per second). Finally, the motion which constitutes light is propa-

gated through space with a speed of 180,000 m. a second.

Velsen, comm., Netherlands. in North Holland, 13 m. W.N.W. of Amsterdam and about 1 m. from the North Sea. Pop. (1910) 18,232.

Velten, vil., Brandenburg, Prussia, 15 m. N.W. of Berlin; manufactures stoves. Pop. (1910) 7,122.

Velvet, a textile stuff, usually of silk, smooth on one side, but sometimes double-faced, with on the other a close, erect nap or pile, formed by the interweaving on brass wires of a second warp, the loops of which, cut or uncut, form the velvet. When made of cotton, it is termed velveteen; other materials are also used. Appearing later than silk, satin, damask, cloth of gold, it marks the end of the Gothic and the advent of renaissance art. Though assigned by some to India, whence it was imported into Italy (Venice, Genoa), Fischbach (*Ornamente der Gewebe*, 1874-8) considers 'it owes its existence to no Oriental source'; while W. Morris (*Textile Fabrics*, 1884), believes it was suggested by pile carpets, invented at Paris in the 14th century. He is supported by Aymer Vallance (*Art Journal*, 1891), who points out that in velvet patterns animal or Eastern symbolism is replaced by foliage. Thus the pineapple symbolizes the West Indies (1492), and the pomegranate Spanish influence (Catherine and Arthur, 1501). Matthew Paris (d. 1259), however, refers to 'napped cloth called by the Gauls villuse.' Again the German *sammet* points to an identification with *samite*; and *musterdevelers* (15th century) may be *moitié develours*. Fustian was probably a coarse imitation. Velvet was used for priestly robes (1363), and for black and red altar cloths, besides supplying 'bonnets' to Saint Louis. Louis

XII., Charles XIII., and Francis I. The magnificent cope made for Henry VII., preserved at Stonyhurst College, woven at Florence, of gold tissue with crimson outstanding design in silk, is probably the finest specimen of the stuff in England; and the art of manufacture reached its climax between the 14th and 16th centuries. In the middle ages Genoa, Venice, Florence, Milan, and Lucca were famous seats of velvet manufacture. In 1536 velvet-making was introduced from Geneva to Lyons, now superior even to Genoa in silk-velvet making. After 1685 refugees from France spread a knowledge of the art in England (Spitalfields and Derby) and Holland (Haarlem). Switzerland, Crefeld, and Bradford are now important manufacturing centres; and Manchester and Amiens are rivals in the output of velveteen. Other varieties are Utrecht velvet, of mohair, stamped for furnishing purposes; plush, of waste or spun silk; tapestry; broché; ribbed; seal, from tussur silk; Genoese, with uncut loop, called 'terry' in England and *frisé* in France.

Velveteen. See VELVET.

Venado, tn., Mexico, in state of and 55 m. N. by W. of San Luis Potosi. Pop. 5,700.

Venaria Reale, tn., Italy, in Piedmont, 5 m. N.W. of Turin. Pop. 5,500.

Vendace (*Coregonus vande-sius*), a fresh-water member of the salmon family, which is nearly related to the pollan, but is confined to Lochmaben in Scotland. It is, however, nearly allied to, if not identical with, a form occurring in the lakes and rivers of Sweden. The vendace is from six to eight inches long, brownish in colour, with a red heart-shaped mark between the eyes, and has the lower jaw slightly protruding.

Vendée, LA, dep. of W. France, between Bay of Biscay on W. and

dep. Deux-Sèvres on E., covering an area of 2,690 sq. m. It is fertile in the s., wooded in the n., and marshy towards the coast. Wheat, coal, salt, and wine are produced. The capital is La Roche-sur-Yon. La Vendée was famous for the stubborn resistance of its people to the revolution (1793-4). Pop. 443,000.

Vendémiaire, the name given by the French republic to the opening month of the calendar. It commenced on September 22nd or 23rd, and closed October 21st or 22nd, and coincided with the vintage (vindemia) season.

Vendetta, a hereditary blood-feud between families or tribes. The custom is not confined to Italy, or to Europe, or to any special period of the world's history. The general form which this 'law of retaliation' assumes is that, when one member of a *gens* has suffered serious injury, or has been put to death, by one or more members of another *gens*, the kinsmen of the victim are bound to inflict a similar injury upon the offenders. The practice still survives among the Corsicans and Sardinians, the Mainotes of Greece, the Tibbus of the Eastern Sahara, and in parts of the United States.

Vendôme (Lat. *Vindocinum*), tn., dep. Loir-et-Cher, France, on Loir, 19 m. N.N.W. of Blois; has manufacture of gloves, leather goods, cotton goods, and cheeses. It has the ruins of a Renaissance abbey, the 12th to 15th century church of the Trinity, and the remains of the 11th-century castle of the dukes of Vendôme. Pop. 9,800.

Vendôme, a former French county and duchy. The countyship was created (1515) a duchy by Francis I. for Charles of Bourbon. Through him it was inherited by Henry IV., and was by him bequeathed (1595) to his natural son César. Louis, Duc de Vendôme, the eldest son of César,

was father of the noted general Louis Joseph.

Vendôme, LOUIS JOSEPH (1654-1712), French general, born at Paris, the eldest son of Louis, Duc de Vendôme, by Laura Mancini, niece of Cardinal Mazarin. He distinguished himself against the Dutch in 1672, and served under Turenne in Germany, and under Luxembourg in the Netherlands, also (1693) under Catinat in Italy. In 1695 he was in command in Catalonia, and took Barcelona in 1697. Five years later he commanded in Italy, and twice fought indecisive battles against Prince Eugène. He overthrew the Austrians at Calcinato in 1706. The same year he superseded Villeroi in the Low Countries, but the disaster at Oudenarde (1708) lost him his credit and command. In 1710 he was again in Spain to support Philip. The Spanish campaign restored his military reputation.

Vendor and Purchaser. The law with regard to the sale of land in England is usually treated under the title of vendor and purchaser. It is provided by sec. 4 of the Statute of Frauds, that no contract for the sale of land can be enforced unless it is evidenced by a memorandum in writing, signed by the party to be charged, or his lawfully authorized agent. The contract does not require to be expressed in one document, but may be contained in a number of documents, such as a series of letters. But the writing must evidence a completed contract, an offer unconditionally accepted without variation. The parties and the property must be described so that there is no real doubt as to their identity, and the consideration must be stated either as a named price, or a price to be arrived at in a specified manner. In contracts of this kind, there is a special obligation to show good

faith, and the vendor must not conceal material latent defects, or the purchaser may be held entitled to avoid the contract. After the contract is made, there remains a good deal to do before the transaction is fully carried out. The title to the property must be shown, and verified, and accepted; a proper deed of conveyance must be prepared and executed; possession must be given to the purchaser, and the purchase money must be paid.

In the case of sales by auction there are usually printed particulars and conditions of sale, which describe the property and set forth the terms on which it is to be sold; and in the case of sales by private bargain, there is usually a formal agreement containing special conditions, which of course regulate the rights of the vendor and the purchaser. But when there are no special conditions, but what is called an open contract, or a simple agreement by the vendor to sell and the purchaser to buy the property described at the price stated, then the law implies certain conditions which regulate the rights and determine the duties of the parties under the contract. As soon as a valid contract is completed, the vendor becomes in equity a trustee of the property for the purchaser, and, as between the parties at any rate, the beneficial ownership passes to the purchaser. The purchaser, on the other hand, becomes a trustee of the purchase money for the vendor. The vendor must take reasonable care of the property, and must pay the outgoings as he receives the rents and profits; but the property is at the risk of the purchaser, and he must bear all accidental losses, and is entitled to all accidental gains. As from the date fixed for completion, or, if there is no date fixed, then from the time at which a

good title is shown, the purchaser is entitled to possession or to the rents and profits, and the vendor is entitled to interest on the purchase money, and has a lien for the unpaid purchase money. The purchaser also has a lien for any deposit paid by him from the date of payment. The rights of the vendor and purchaser as between themselves are not affected by the death, bankruptcy, or lunacy of either party. See *Dart's Vendors and Purchasers of Real Estate* (ed. 1905), and *Williams's Law of Vendor and Purchaser* (1906).

Venediger, GROSS, a snowy summit (12,008 ft.), the second highest of the Hohe Tauern range in the Central Tyrolean Alps. It was first climbed in 1841 by a party of twenty-six men.

Veneer, a very thin sheet of ornamental wood glued over common wood. See **WOODWORK** and **INLAYING**.

Vener, or **WENER**, the largest of the Swedish lakes, in the S.W. of the country, is 290 ft. deep, and 2,150 sq. m. in extent. Its chief feeder is the Klar (from the N.). Towards the south the lake discharges through the Göta.

Venerable, a British battleship (of 15,000 tons and 18 knots), launched 1899. A ship of this name took part in the battle of Camperdown (1797).

Venereal Diseases embrace three distinct contagious disorders, which are usually contracted and transmitted by impure sexual intercourse: (1) simple or soft chancre, sometimes called local venereal sore, (2) syphilis, and (3) gonorrhœa. The soft sore begins within a few hours after contagion as a pustule, which bursts and leaves an excavated ulcer with abundant purulent discharge. It is usually multiple, and is seldom situated far from the genital organs. Repeated attacks are common, but

soft chancres never cause general infection of the system. Syphilis and gonorrhœa are treated in separate articles.

Venersborg, *tn.*, Sweden, cap. of the gov. of Elfsborg, at the s.w. extremity of Lake Vener, 52 m. N. by E. of Göteborg. Pop. (1911) 7,648.

Venesection, or **PHLEBOTOMY**, an operation for the abstraction of blood from an incised vein. The arm is bound above the elbow with a broad bandage. The vein is then opened by an oblique slit. Slight pressure over the wound is sufficient to arrest the hæmorrhage, and an antiseptic dressing should be applied, and kept in position by collodion or by a figure of eight bandage round the forearm. The operation is now seldom performed, although in the early part of the 19th century healthy men, women, and children were bled as a matter of course, three or four times yearly, while in disease its application was almost universal. In many morbid conditions venesection is undoubtedly of value as a remedial measure.

Veneti, an ancient tribe of N. Italy. Homer mentions a tribe called Heneti in Paphlagonia, whom the ancients believed to have settled in N. Italy, led by the Trojan prince Antenor; but this is at least doubtful. Tacitus mentions a tribe living on the s. shore of the Baltic as Venedi or Veneti, who are identical with the modern Wends; it is on the whole most likely that the Italian Veneti were an offshoot from them. Mommsen, however, classes the Veneti as Illyrians, or perhaps Albanians. Gradually the Veneti came under Roman rule, by way of alliance, not of conquest, probably during the 2nd century B.C. Attila in 452 A.D. destroyed Aquileia, Concordia, Altinum, Patavium (Padua), Verona, and other cities belonging to them. Their

fugitive inhabitants took refuge in the small islands among the lagoons which border the coast; and out of these settlements grew Venice. See **VENICE**.

Venetia, a compartimento of the kingdom of Italy, in the extreme N.E., with an area of 9,475 sq. m. and a pop. (est. 1910) of 3,500,000. It includes the provs. of Belluno, Padua, Rovigo, Treviso, Udine, Venice, Verona, and Vicenza.

Venetian Red, a pigment composed of ferric oxide, Fe_2O_3 , and obtained by igniting ferrous sulphate. It is of fine rich colour, and is permanent and harmless.

Venetian Style. In the 13th century, when the cathedrals of Amiens, Salisbury, and Toledo were built, Italy attempted to imitate them, and many of the buildings erected in Venice in the 14th century exhibit this foreign influence, and are said to be in the Venetian or Venetian Gothic style. The palace of Ca d'Oro is a good example.

Venezianov, **ALEXANDER** (1779-1845), called the Father of Russian painting. When genre was considered the lowest grade of art, Venezianov turned to the depiction of peasant life. His method of work was inspired by a study of English copperplate engravings. His work is heavy, earnest, observant, and truthful.

Venezuela, a S. American republic, extending along the N. coast from British Guiana to the Gulf of Venezuela, and bordering on Colombia and Brazil in the w. and s. It is divided into a federal district, 20 states (each autonomous and politically equal, with a president and legislative assembly), and 2 territories. Geographically it falls into three divisions: a mountain land along the northern coast, the plains of the Orinoco, and a region of older degraded elevations s. of the river—Venezuelan Guiana.

In the N.W. the cordillera of Merida runs north-eastwards to Barquisimeto, while another branch, the cordillera of Perija, forms the boundary of the republic W. of Lake Maracaibo. These ranges are distinct from the Andes proper. Their maximum height is about 15,400 ft., and many of the summits are capped with snow, the snow-line lying at about 13,000 ft. above sea-level. The Caribbean Mts., which reach up to 9,125 ft. in Naguata, extend to Trinidad with two breaks—the one at Barcelona, the other at the Gulf of Paria. The islands Tortuga, Margarita, and perhaps Tobago, are probably the summits of a submerged range. The llanos were formed by Quaternary deposits laid down on Tertiary formations by a sea which rose to a height of from 700 to 1,000 ft. up the slopes of the mountains. In the W. they are well watered, but between the Rio Chico and Soledad lies a sandy desert. Venezuelan Guiana is supposed to consist of crystalline rocks overlaid in the E. by enormous masses of Cretaceous sandstone, which rise to the highest summits, such as Roraima (8,530 ft.). The inner recesses of the western part have seldom been visited by travellers, the dense woods and exceedingly moist atmosphere rendering progress difficult except along the larger streams. Near the Orinoco and its chief tributaries savannas suitable for grazing lie among the hills.

The coast is particularly hot, La Guaira having an annual mean of $83\frac{1}{2}^{\circ}$, and in the llanos the heat is said to be still more oppressive. The rainfall is 70 in. a year at Maracaibo, 65 in. on the Caribbean coast, 63 in. at the Gulf of Paria, 60 in. along the Orinoco, and $31\frac{1}{2}$ in. at Caracas. Agriculture is the principal occupation of N. Venezuela. The most important crops are coffee, cocoa, sugarcane, maize, and bananas; while

tobacco, cotton, copra, and potatoes are of minor importance. The forests yield timber, copaiha balsam, vanilla, cinchona bark, dye-stuffs, and rubber, as well as skins of wild animals. Gold occurs abundantly in the Yuruari basin, the richest mine being El Callao. Copper is worked at Aroa, N. of Barquisimeto, and iron occurs near Trujillo. Silver, lead, tin, sulphur, salt, kaolin, and petroleum also occur. The coal mines of Naricual (Barcelona) promise to be very valuable, and seams also occur between Caracas and Valencia. Asphalt is found at the Gulf of Paria and Lake Maracaibo. The chief ports are La Guaira, Puerto Cabello, Maracaibo, and Ciudad Bolivar on the Orinoco. La Guaira is connected by rail with Caracas, the capital.

The coast of Venezuela was seen by Columbus on his third voyage to America in 1498, and the Spaniards gradually subdued the country, Coro being their headquarters. In 1749 the colonists rose in revolt. On this occasion the insurrection was suppressed, but new disturbances broke out in 1797, resulting in 1819 in the formation of the republic of Colombia, in which the present Colombia and Ecuador were included. On the death of Bolivar in 1830 the federation was dissolved, and the present republic of Venezuela was formed. In 1895-6 the dispute between Venezuela and Britain as to the boundary between the former country and British Guiana became dangerous, in consequence of the intervention of President Cleveland, as the defender of the Monroe doctrine, on behalf of Venezuela. The difference was, however, referred to the arbitration of an Anglo-American commission, which sat at Paris in 1899. In 1900 General Cipriano Castro became president. In 1902 Germany and Britain instituted

a blockade of the Venezuelan ports in default of satisfaction for injuries done to their subjects. The dispute was ultimately referred to the Hague Tribunal, which in Feb. 1904 decided that Great Britain, Germany, and Italy were entitled to preferential treatment in respect of the 30 per cent. levied on the customs receipts at La Guaira and Porto Cabello. The United States of America was commissioned to see that the judgment was carried out. In the meantime President Castro had created further foreign estrangements by cancelling most of the concessions granted to foreigners by his predecessor, and by placing heavy fines on other foreign concerns doing business in Venezuela. The cancellation of a concession to the French Cable Co. led to a rupture of diplomatic relations with France in 1906.

In 1908 trade was suspended between Venezuela and the Dutch colony of Curaçoa. On June 23 the United States severed diplomatic relations, and the same week the Dutch minister was given his passports. Four Dutch vessels were seized. Brazil was refused permission to take charge of French interests, the ports were closed to British trade, while Castro issued bombastic proclamations defying Europe. Anti-Castro riots followed, and Castro sailed for Europe in Nov. 1908 (ostensibly for surgical treatment), leaving Vice-President Juan Vicente Gomez in charge. On Dec. 21, however, Gomez was proclaimed president, and relations with the European powers were re-established. Gomez was formally installed president in June 1910. On Dec. 31, 1909, the total debt of the republic amounted to £8,237,230.

In 1909-10 the total imports were valued at £2,243,215; and the exports, chiefly coffee (£1,469,613), cacao, balata, hides,

rubber, and 'sernambi,' and gold at £3,422,557.

Venezuela is governed by a president, elected by congress for four (formerly six) years. The legislative power is exercised by a congress consisting of a senate and a chamber of deputies. The present constitution only dates from Aug. 1909. There are five bishops—of Merida, Barquisimeto, Calabozo, Zulia, and Guaiana—subordinate to the archbishop of Carácas. The Roman Catholic is the state religion, but all others are tolerated. There is a standing army of about 9,000 men, and service in the national militia is compulsory. There are about 500 m. of railway. The population is chiefly of Indian blood, mixed with white and negro. Area about 398,600 sq. m. Pop. 2,700,000. Capital, Carácas. See H. J. Mozan's *Up the Orinoco and down the Magdalena* (1910); H. Bingham's *The Journal of an Expedition across Venezuela and Colombia* (1909); W. L. Scrugg's *The Colombian and Venezuelan Republics* (2nd ed. 1905); S. P. Traina's *Down the Orinoco in a Canoe* (1902); Villavicencio's *La Republica de Venezuela* (1899); Sachs's *Aus den Llanos* (1899); Sievers's *Venezuela* (1888); Mombello's *Venezuela y sus Riquezas* (1890); and Spence's *The Land of Bolivar* (1878).

Venezuela, GULF OF. See MARACAIBO, GULF OF.

Vengurla, seapt. tn. and municipality, Ratnagiri dist., Bombay Presidency, India, 33 m. N.W. of Goa. In 1812 it was ceded to the British. Pop. 19,000.

Venial Sins are differentiated from 'mortal' sins, which the Council of Trent defined as offences that separate the soul from God. Venial sins are rather faults than offences.

Venice. (1.) Fortified seapt. and cap. of prov. of Venice, N.E. Italy, in the lagoons of the

Adriatic, between the Piave and the Po, 164 m. by rail E. of Milan. The foundations of the city rest on piles driven into the mud. The principal thoroughfare is the Serpentine Grand Canal (2½ m. long), which divides the city into two nearly equal parts, and from which numerous smaller canals branch. Glass is one of its most famous manufactures, beads, all sorts of Venetian ware, mirrors, mosaics, electric lamps, candelabra, etc., being manufactured chiefly on the island of Murano; also tapestry, brocades, lace (on the island of Burano), velvets, silks, machinery, and chemicals. Shipbuilding and the making of torpedoes are carried on. The ninth Venice exhibition was held in 1910. Venice is one of the three departments of local naval administration, the other two being Spezia and Naples. The value of the exports in 1909 was £6,293,429, and of the imports £11,744,632. The chief exports are yarns, silk, woollen and cotton manufactures, glass ware, wheat and other cereals, and hemp. In 1909, 4,221 vessels of 2,298,028 tons entered the port of Venice. Among the many fine churches, the basilica of St. Mark is noted as one of the three finest in Italy; others churches are those of SS. Giovanni e Paolo (the burial-place of the doges), Santa Maria dei Frari, Santa Maria della Salute, San Giorgio degli Schiavoni, San Salvatore, and San Pietro di Castello. On the N. side of the Piazza of St. Mark stands the Procuratie Vecchie, and on the S. side the Procuratie Nuove (now part of the Palazzo Reale, and the doge's palace on the E.). Other palaces are the Contarini on the Grand Canal, Foscari, and Vendramin-Calergi. There are many fine tombs, including those of Pietro Mocenigo, Andrea Vendramin, and Michele Morosini. Other places and objects of great

interest are the Academy of Fine Arts (containing Venetian canvases from the earliest times), the municipal museum, the quay Riva degli Schiavoni, the Rialto, the Bridge of Sighs, and the granite column, surmounted by the Winged Lion of St. Mark, on the Piazzetta. The famous Campanile collapsed on July 14, 1902. Its reconstruction was completed in 1911. The Lido and the Littorale di Malamocco are favourite resorts. Pop. (1905) 160,000.

History.—The marshes and islands of the lagoons at the N.W. end of the Adriatic were first inhabited by refugees from the barbarian invaders of Italy. In the 7th century the twelve 'townships' agreed to elect one supreme magistrate, the 'doge.' Venice maintained her independence of the mainland states, while the skill of her citizens as sailors enabled her to develop a powerful fleet, and to become a great commercial state. She dominated the Adriatic, and gradually absorbed most of the carrying trade of the world, sending her ships as far as England for wool and to the Black Sea for furs, while her merchants penetrated to India and China. By taking part in the crusades she obtained trading stations in the Holy Land, and as the Eastern empire fell into decrepitude acquired many of its possessions, establishing colonies in Crete, Cyprus, the Morea, and the Aegean Islands. But she soon came into conflict with Genoa, with whom she struggled for the monopoly of Eastern trade. The favour shown to Genoa by the Greek emperors led Venice to assist in establishing the Latin empire of Constantinople (1204-61), which was practically under her direction. After three ruinous but indecisive wars, the final contest was fought out in 1379. The Genoese penetrated into the

lagoons, and blockaded Venice itself; but her people in turn blockaded the Genoese fleet, and forced it to surrender.

By ruining the houses of Scala and Carrara, Venice acquired Treviso, Verona, Padua, and other towns on the mainland of Italy, and at the expense of the dukes of Milan she obtained Brescia, Bergamo, and Cremona. This involved her in a great expenditure on mercenary armies. The other states became very jealous of her; and she was attacked by a European alliance, the League of Cambray (1509), including the emperor and the kings of France and Spain. Venice lost nearly all her mainland territory; but her enemies soon quarrelled amongst themselves, and she was able to regain a great part. Her resources were exhausted by these wars, and her commercial supremacy began to decline after the discovery of the Cape of Good Hope (1486).

Meanwhile she had been, since the fall of Constantinople (1453), involved in a terrible struggle with the Turks. The Venetians defended their eastern colonies with great gallantry, and it was to them that the victory of Lepanto (1571) was mainly due. The struggle lasted until 1718, when the Morea, the last of their eastern possessions, was lost. Venice had meanwhile sunk into political insignificance, though she maintained her independence until she had to submit to Napoleon (1797). Her government was monopolized by a strong oligarchy, which, by the 'closing of the Grand Council' (1797), finally excluded all but members of aristocratic families from political power. At the same time, the council stopped any danger of the establishment of a tyranny, as in other Italian states, by preventing the doge from making his office hereditary, and gradu-

ally depriving him of all substantial power, until he became a mere figure-head. The chief place in the government was from the 14th century taken by the Council of Ten, which proved a most effective, secret, and powerful executive.

After the fall of Napoleon, Venice fell to Austria; but the government was so oppressive that she revolted, and under the leadership (1848-9) of Daniele Manin she drove out the Austrians, and joined in the struggle for Italian independence. Even after the failure of Charles Albert's expeditions into Lombardy, she refused to yield, and was only reduced, after a year's siege, by famine and cholera. When Lombardy was freed in 1859, Venice remained under the Austrian yoke, and it was not until 1866 that she was united to the Italian kingdom. See Romanini's *Storia Documentata di Venezia* (1853-61), Heyd's *Le Colonie-Commerciari degli Italiani in Oriente* (1865), Brown's *In and around Venice* (1905), Hodgson's *Early History of Venice* (1901), and *Venice in the Thirteenth and Fourteenth Centuries* (1910); Marion Crawford's *Gleanings from Venetian History* (1905), Molmenti's *History of Venice* (Eng. trans. by H. F. Brown, 1906-7), *Venice*, by Beryl De Selincourt and May S. Henderson (1907), H. F. Brown's *Studies in the History of Venice* (1907), Okey's *Venice and its Story* (rev. ed. 1910), and *Venice and Venetia* (1911).

Venice, prov. of Italy, bounded on the S.E. by the Adriatic; has an area of 935 sq. m. and an est. pop. (1910) of 450,000.

Venice, GULF OF. The N. portion of the Adriatic Sea, between Venice and Istria. Its extreme N.E. portion is known as the Gulf of Trieste.

Veni, Creator Spiritus, an invocation to the Holy Ghost,

found in the collection of ancient hymns by Thomasius, and in the pontifical of Soissons (11th century). The first version in the English Book of Common Prayer was introduced in 1661. The *Veni Creator* is used in the English Ordinal before the laying on of hands at ordination of priests and at consecration of bishops.

Venlo, tn. and railway junction of the Netherlands, prov. Limburg, 43 m. by rail N. by E. of Maastricht, on r. bk. of the Maas. The manufactures include beer, leather, needles, and tobacco. Pop. (1910) 17,102.

Vennachar, LOCH, S.W. Perthshire, Scotland, is formed by the expansion of the Teith. It is nearly 4 m. in length. The scenery of the lake is very picturesque, and is described in Scott's *Lady of the Lake*.

Venosa, tn., Potenza prov., Basilicata, S. Italy, 23 m. N. of Potenza; was the birthplace of Horace. It has a cathedral, an 11th-century abbey, and a 15th-century castle. Pop. 8,500.

Venraij, comm., Netherlands, in Limburg, 30 m. S. by E. of Arnhem. Pop. (1910) 7,996.

Venta, the ancient name of three towns in Britain. (1.) Venta Belgarum, now Winchester, where Roman remains have been found. (2.) Venta Silurum, on the W. coast of the estuary of the Severn, in Monmouthshire, now known as Caerwent. (3.) Venta Icenorum, on the E. coast of England, probably Caistor on the Wensum, S. of Norwich.

Venti, the Latin for 'the winds.' Homer mentions Boreas (N. wind), Eurus (E.), Notus (S.), and Zephyrus (W.), with their master Æolus, who dwelt in the island Æolia. According to Hesiod, the beneficial winds were Boreas, Notus, and Zephyrus; and the destructive ones, such as Eurus, and especially Typhon, were the offspring of Typhæus.

In art the winds are usually represented (especially on the Tower of the Winds at Athens) with human bodies, winged shoulders, and various attributes.

Ventidius, or in full, PUBLIUS VENTIDIUS BASSUS, Roman general, was a native of Picenum. In the Gallic campaigns and in the civil war he served Cæsar well, and became tribune, senator, and after Cæsar's death prætor, in 43 B.C. He then aided Antony; was made consul; continued to support Antony when at variance with Octavian; and in 39 was sent as his deputy into Asia against Labienus. There he defeated the Parthians, secured the army of Labienus, and defeated the Parthians a second time in Cilicia. He then occupied Syria and Palestine, and a third time defeated the Parthians under Pacorus. Antony then arrived, and in jealousy dismissed Ventidius; but the senate voted him a triumph in November 38 B.C.

Ventilation. A human being expires from '6 to '8 cub. ft. of carbon dioxide (CO₂) per hour, besides polluting the atmosphere with various organic impurities. Since these latter increase proportionally as the carbon dioxide increases, the quantity of CO₂ in a sample of air is usually taken to represent its quality. Pure fresh air has from 2 to 5 parts of CO₂ per 10,000, and in no case should the proportion rise above 10 parts per 10,000. For living apartments 6 to 8 parts is the maximum allowable in good ventilating practice. In Britain, if the air is warm, a room may be emptied and filled with pure air four or five times per hour, while with cold air three times is the maximum without causing draughts. It may be calculated that a man requires about 3,000 cub. ft. of air per hour. A woman takes 2,500, and a child 1,600. cub. ft. per hour respectively.

A horse or a cow requires about 8,000 cub. ft. of air per hour, or, assuming that its supply of air is changed five times per hour, it should have 1,600 cub. ft. of space. Gaslights in a room pollute the air to the extent of 1 cub. ft. of CO₂ for each 2 cub. ft. of gas properly burned. An ordinary three-light gasalier burns 12 cub. ft. of gas per hour.

Overcrowding.—In 1863, Glasgow obtained parliamentary powers to deal with overcrowding. This act was amended in 1890, when the standard of cubic space was raised from 300 to 400 cub. ft. for an adult, and 200 cub. ft. for a child below ten years of age. Prisons have from 750 to 800 cub. ft. of space per individual; seamen's cabins and canal boats, 180 for the aft cabin and 80 for the fore cabin; schools, from 100 to 240; and hospitals, from 800 to 4,000 cub. ft. per individual.

Inlets.—Air at 50° or 60° F. may come into a room at the rate of about 2 ft. per second. The outside of an inlet shaft should be guarded by a baffle plate, grating, or wire gauze. The area of the inlet must be increased from 25 per cent. to 50 per cent. at a grating or gauze screen, to compensate for friction. A common form of inlet is Tobin's tube. It consists of a square box or tube fastened to the wall of a room. The lower end communicates with the outer air, while the upper end opens into the room. The area of the opening may be regulated by a valve, and a muslin filter may be inserted to keep particles of dust out of the room. A coil of hot pipes in the tube may heat up the incoming air, or the air may be passed through a radiator before entering the apartment. An ingenious arrangement was invented by the medical officer for Leeds. In an

enlarged Tobin's tube coils of hot-water pipes are placed on one side of a central diaphragm. A valve at the top of this diaphragm may shut down either on the top of the pipes, or on the top of the vacant space. In the first case the air is not warmed, but simply passes through the vacant half of the Tobin's tube, while in the second case the air is constrained to pass between the pipes and is heated. Stevens's ventilator is like a drawer without a back set in a wall. The Sheringham valve is simply a flap in the wall, and has sides to it. It may be opened to any desired extent, and throws the supply of fresh air upwards, preventing cold draughts on the head. Fresh air should be admitted into a room about six feet above the floor. Dr. Bird's method of window ventilation achieves this. A board is put below the lower sash of an ordinary window, and air comes in at the opening so made in the middle of the window. Arrangements of concentric tubes to act as inlets and outlets combined are not satisfactory, as an open window or even a fire in the room may turn both tubes into either outlets or inlets.

Outlets.—As an outlet an opening may be made near the ceiling of a room into the chimney. This opening would be guarded by a flap valve of metal, mica, or silk, which allows air to pass from the room into the chimney, but instantly shuts when air tries to pass from the chimney into the room. In Dr. Chowne's inverted siphon system the foul air is led to the back of the fireplace about nine inches from the floor, and thence away by the chimney. A shaft may be led from the outlet up to the mason-work of the chimney, and a louvre fitted there. A very satisfactory outlet is either the Boyle or Buchan

air-pump extractor. The wind or motion of the atmosphere, acting on the thin metal plates of which these extractors are made, is diverted through them in such a way as to draw air from the shaft. The Emerson cowl is a cone of sheet metal fixed on the top of a pipe. The cone should have a base of the same material, to prevent currents of air impinging on the inner surface of the cone and being directed down the pipe. Sugg's ventilator is similar, but has a mica flap to prevent down-draughts. The draughts induced by gaslights and fires may be utilized. In the House of Commons the incoming air is washed, cooled by ice trays or heated by hot pipes, and may be filtered through cotton wool to exclude fog. It is supplied to the house through cocoanut mats on the floor, and rises upwards through the glass roof owing to the influence of the gases burning there, and also of the furnace which burns constantly in St. Stephen's tower at Westminster.

The Use of Fans.—Fans may be used either to draw the air out of a series of rooms or to force the air in. The Blackman fan is a good exhausting fan, and the Sturtevant a good forcing fan. It is argued by those who believe in forcing fresh air into a room (this is called the 'plenum' system) that the amount of air can be exactly regulated as regards quantity, temperature, and humidity. Fans are used extensively for removing dust and refuse from grinding-shops, carpet-beaters, sawmills, and such places, and for forcing warmed and moistened air into textile and other workshops. A fan four feet in diameter will pass about 20,000 cub. ft. of air through it per minute, running at the rate of 500 revolutions per minute, and consuming $1\frac{1}{2}$ horse power.

See *Thomas's Ventilation, Heating, and Lighting of Dwellings* (1905); *Kittredge's Warming and Ventilating*; *Billing's Ventilation* (1893); *Buchan's Ventilation* (1891); and *Parkes's Hygiene* (1891); also article on HEATING.

Tunnels.—The ventilation of tunnels is usually effected by the extraction of the vitiated air at, if possible, some point midway between the ends, up a shaft, in which is fixed a large fan. In the Mersey tunnel a ventilating heading was driven from each shore to the centre (and lowest part) of the tunnel, from which the air is extracted and drawn away by fans 40 ft. in diameter. For the Pracchia tunnel (between Florence and Bologna), in the St. Gothard tunnel, and in others, the Saccardo scheme of ventilation has been applied. By this system a large volume of air is blown into the mouth of the tunnel, in the annular space between the interior surface of the tunnel and that imaginary line inside which a train could just pass. This is effected by extending the tunnel for 15 or 20 ft. by a structure of timber or brickwork, the inside surface of which follows this imaginary line (the 'gauge of maximum construction'), and projects a few feet inside the tunnel. Into the chamber thus formed air is blown by a fan, and forms a strong current through the tunnel—independent itself of any passing train, and inducing, when no train is going through, an additional current through the interior space, after the manner of an injector.

For ventilation of mines, see COAL-MINING.

Ventimiglia, fort. seapt., Porto-Maurizio prov., Liguria, N. Italy, on Mediterranean, 9 m. w.s.w. of San Remo: has a museum of Roman antiquities, and a Gothic cathedral, which

occupies the site of a temple of Juno. Pop. 11,500.

Ventnor, wat.-pl., Isle of Wight, England, 10 m. S.E. of Newport, situated on the Undercliff, and sheltered by St. Boniface Down (787 ft.). It enjoys a mild climate, beneficial in pulmonary affections; has a Royal National Hospital for Consumption, and other sanatoria. Bonchurch is a suburb. Pop. (1911) 5,787.

Ventriculites, a genus of fossil hexactinellid (six-rayed spicules) sponges, very characteristic of the Upper White Chalk. They are cup or funnel shaped, with a series of root-processes at their base, and a large central cavity.

Ventriloquism is the art of producing the voice in such fashion that the sound appears to proceed from a source other than the speaker's mouth. The illusion is heightened by immobility of the visible muscles concerned in speech, as well as by gestures and glances which suggest to the onlooker a false source of the sound. Few ventriloquists can deceive in the dark; and most depend upon marionettes with movable lips, to the movements of which the attention of the audience is directed. The art owes its name to the erroneous idea of the Romans that the performer produced the voice in the stomach or abdomen. See Russell's *Ventriloquism* (1898).

Venue, the place from which a jury is to be summoned for the trial of an action or of an offence. In civil actions the venue was formerly important, owing to the distinction between 'local' and 'transitory' actions. Local actions arose from causes of action necessarily referring to a particular locality—e.g. trespass to land. Transitory actions were those not connected with

the land—e.g. actions for assault. In local actions it was necessary to 'lay the venue' in the county where the cause of action naturally arose. In transitory actions the plaintiff could generally choose his venue, and it did not matter even if the tort was committed abroad. (See *British South Africa Co. v. Companhia de Mozambique*, 1893, App. Cas. 602). The rules of the Supreme Court direct that 'there shall be no local venue for the trial of any action, except where otherwise provided by statute; but in every action in every division the place of trial shall be fixed by the court or a judge.' In criminal cases the venue is co-extensive with the jurisdiction of the court.

Venus, the second planet from the sun, known to the ancients, under its two aspects of morning and evening star, as Phosphorus and Hesperus. The knowledge of their identity was imported probably by Pythagoras from the East. Venus is the brightest of the planets. When the planet has an eastern elongation of approximately $39\frac{1}{2}^\circ$, its distance from ourselves is about 40,000,000 m. (Whitmell). Its light is then so brilliant as to attract the eye in full daylight, and to cast distinct shadows after dark. Venus describes round the sun, with an average velocity of 22 m. a second, in a period of 224 $\frac{1}{7}$ days, a slightly eccentric orbit, inclined $3^\circ 23\frac{1}{4}'$ to the ecliptic. At its mean distance of 67,200,000 m., the solar radiation has twice its terrestrial intensity. The diameter of the planet is about 7,600 m., and there is no perceptible polar compression. Its mass is 0.82 and its density 0.94 those of the earth. Schiaparelli's conclusion of an axial movement performed in 225 days synchronously with the orbital circulation has the weight of evidence in its

favour, although other observers favour a period of $23\frac{1}{2}$ hours. The spectrum of Venus is that of reflected sunlight. Venus has no satellite.

Transits of Venus across the sun are observed when inferior conjunction occurs near one of the nodes of her orbit, the sun, planet, and earth being then nearly in a line. Under present conditions—and they will last for the next thousand years—transits are coupled, a June pair separated by eight years being succeeded, after a lapse of $105\frac{1}{2}$ years, by the first of a December pair, while the corresponding interval from a December to a June transit is $121\frac{1}{2}$ years. The motion of the planet on the sun, as viewed from the earth, is from east to west (left to right), and occupies, when the path pursued is central, just eight hours.

The first recorded transit of Venus was that observed by Horrocks and Crabtree on December 6, 1639; the companion event in 1631 had escaped notice. The next pair took place at the opposite node in June 1761 and 1769, and excited world-wide attention; for Halley had, meanwhile, in 1679, pointed out the availability of these occurrences for determining the distance of the sun, and observers intent upon turning them to full account took up stations in both hemispheres from Lapland to Otaheite. The results discussed by Encke yielded a value of 95,000,000 m. for the astronomical unit, and though it proved largely erroneous, its definitive correction was confidently undertaken on the occasions of the December transits of 1874 and 1882. But the outcome was virtual failure, the required degree of accuracy being rendered unattainable by irremediable optical difficulties. The next pair of transits are due on June 8, 2004, and June 6, 2012.

Venus, the ancient Roman goddess of love; such, at least, she became after her identification with the Greek Aphrodite. Originally she appears to have been a goddess of gardens and of the Plebs, but was not recognized in the early state worship. The earliest temple in her honour was built in 297 B.C. After the introduction of the worship of Aphrodite of Eryx from Sicily, about 220 B.C., she was worshipped as Venus Genetrix, 'mother of living creatures,' and as Venus Victrix, 'who conquers the world,' and under other titles. As the wife of Mars, the tutelary god of Rome, and the mother of Æneas, she was regarded in a special way as the mother of the Roman people. See W. Warde Fowler's *Roman Festivals* (1908).

Venusberg, in German legend, the mountain grotto in which the knight Tannhäuser found Venus and her court, and spent his days with her in a long debauch, till, satiated and filled with remorse, he sought Pope Urban at Rome, and begged absolution for his sin. It is generally identified with a hill near Eisenach in Thuringia. See Filson Young's *Wagner Stories* (1908).

Venus's Fly-trap, an insectivorous plant, a native of the sandy savannas of N. Carolina. The leaves are all radical, and they have the property of closing round insects which alight on them. See further under INSECTIVOROUS PLANTS.

Venus's Looking-glass, a hardy herbaceous plant belonging to the order Campanulaceæ. It bears lanceolate leaves and purple flowers. It is easily cultivated in ordinary garden soil.

Vera, tn., Spain, in prov. of and 40 m. N.E. of Almería. In the district there are lead and silver mines, and marble, alabaster, and building-stone quarries. Pop. 8,500.

Vera, AUGUSTO (1813-85), Italian philosopher, born at Amelia in Umbria; taught philosophy in France, resided in England from 1851 to 1860, and was appointed a professor of philosophy in Naples University (1862). Among his works, which include translations of Hegel into French, are *Il Cavour e Libera Chiesa in Libero Stato* (1871), *Essais de Philosophie Hégléenne* (1834), *Introduction à la Philosophie de Hegel* (1855), and *Strauss et l'Ancienne et la Nouvelle Foi* (1873). See *Mariano's Augusto Vera* (1887).

Vera Cruz. (1.) An E. state of Mexico, extending along the Gulf of Mexico. Area, 29,000 sq. m. The chief products are maize, wheat, tobacco, coffee, sugar, vanilla, and rubber. Cap. Jalapa. Pop. (1910) 1,124,368. (2.) Tn., in state of same name, and chief seapt. of Mexico, on Gulf of Mexico, 200 m. E. by S. of the capital. It is often visited by yellow fever, but much improvement is expected from a new system of drainage and waterworks. The harbour has been converted into a first-class port, with an area of nearly 500 acres. The manufactures include tobacco, textiles, iron, liquors, pottery, preserved fruits, and furniture. In 1909-10 the imports were valued at £3,333,772, and the exports (chiefly gold and silver ores—coffee, skins and hides, broom root, beans, peas, sugar, vanilla, and rubber) at £3,970,086. Pop. 30,000.

Veranillo, the short dry season near midsummer in intertropical America.

Verano, the name applied to the long dry season near midwinter in intertropical America.

Verapoli, tn., Travancore state, Madras Presidency, India, 9 m. N.E. of Cochin; the seat of a Carmelite mission, and of the vicar-apostolic. A large percentage of the population are

Syro-Nestorians or Syrian Christians.

Veratrine, an alkaloid obtained from *sabadilla* seeds. It forms colourless crystals, that have a bitter taste and excite sneezing. It is used in medicine as an external application to produce local anaesthesia, but is an active poison if taken internally.

Veratrum, a genus of hardy herbaceous plants belonging to the order Liliaceæ. They bear terminal panicles of flowers, usually broad leaves, and a thick poisonous rhizome.

Verawal, seapt. tn. on S.W. coast of Kathiawar peninsula, Bombay Presidency, India, 40 m. N.W. of Diu. Pop. 17,000.

Verbascum. See MULLÉIN.

Verbena, a genus of mostly American herbaceous plants belonging to the order Verbenaceæ. They bear usually dense terminal spikes of small flowers, with five-cleft calyxes and unequally five-cleft corollas. *V. officinalis*, the common vervain, is a British plant, common on waste ground. *Aloysia citriodora*, the lemon-scented verbena, belongs to the same natural order.

Verbenaceæ, a natural order of herbs, shrubs, or trees, widely distributed over the warmer parts of the world. Among the genera are *Lantana*, *Verbena*, *Vitex*, *Clerodendron*, and *Tectoma*.

Verbicaro, tn., Italy, in prov. of and 38 m. N.N.W. of Cosenza. Pop. 5,600.

Verboeckhoven, EUGEN JOSEPH (1799-1881), Flemish painter, born at Warneton in W. Flanders, whose skill was mainly devoted to the delineation of peasant and animal life. Chief works: *Sheep surprised by a Storm*; *Horses attacked by Wolves*; *Sheep in the Campagna*; *Souvenirs of Scotland*; *Ewe and Lambs, or the Good Mother*.

Vercelli, tn., Novara prov., Piedmont, N. Italy, on r. bk. of

Vesia, 37 m. w. by s. of Milan; is a railway centre, and has corn and rice mills. Cotton and woollen goods, silks and machinery, are manufactured. It is the seat of a bishop. The church of St. Andrea dates from the 13th century. Pop. 32,000

Vercelli Book, or **CODEx**, a manuscript in the cathedral library at Vercelli, was early in the 19th century conjectured to be an Old English MS. Its contents of the Codex are these: (1) Homilies, (2) *Andreas*, (3) *Fates of the Apostles*, (4) Homilies, (5) *Address of the Soul to the Body* (fragment), (6) *Falsehood of Men* (fragment), (7) *Dream of the Rood*, (8) Homilies, (9) *Elene*, (10) *Life of Guthlac*, in prose. All but the homilies and No. 10 are in verse. Cynowulf was the author of Nos. 3 and 9. The handwriting is of the 11th century. The poems of the Vercelli Codex occupy the Grein-Wülker *Bibliothek* II. i. See Wülker's *Grundriss* (1885).

Vercingetorix, an ancient Gaulish chieftain of the tribe of the Arverni, who in 52 B.C. raised a rebellion against Caesar. At first he gained several victories over the Romans, but finally was shut up in Alesia, and taken prisoner on its capture. He was kept to adorn Caesar's triumph in 46, and was then executed.

Verde, CAPE. See CAPE VERDE ISLANDS.

Verde-antique includes all the varieties of green serpentine marble (or opicalcite) which were prized as ornamental stones by the ancient Romans. Green Connemara marble is an essentially similar rock. The ancient supplies were mostly drawn from Greece and Italy.

Verden, tn., Hanover, Prussia, on the Aller, 22 m. by rail E.S.E. of Bremen; manufactures agricultural machinery, beer, cigars, and soap. Its Gothic cathedral

dates from the 13th century. Pop. (1910) 10,054.

Verdi, GIUSEPPE (1813-1901), Italian operatic composer, born at Roncole, near Busseto, in the duchy of Parma. He became organist at Busseto in 1833, but five years later returned to Milan, where his first opera, *Oberto* (1839), was produced. It was the success of his fourth opera, *I Lombardi* (1843), which established his reputation. Of his twenty-eight operas perhaps the best known are *Rigoletto* (1851), *Il Trovatore* (1853), *La Traviata* (1853), *Aida* (1871), *Otello* (1887), and *Falstaff* (1893), a comic opera. His earlier operas were composed in the traditional Italian style, but in his later and much greater works the influence of the romantic school is clearly shown. His chief important non-operatic work is a *Requiem Mass* (1874). See the article in *Grove's Dictionary of Music*; also Poug'n's *Life of Verdi* (1887).

Verdict, the determination of a jury at a trial, declared to a judge by the foreman of the jury. A verdict is called 'general' when the jury simply return a verdict of guilty or not guilty, or in a civil case a verdict for the plaintiff with damages, or for the defendant; and a jury may always refuse to give a special verdict, in which the jury find particular facts to be so, and leave it to the judge to apply the law to such facts. The verdict of a jury must be unanimous, except in civil actions where the parties agree to accept the verdict of a majority. The judge is not bound to accept a verdict tendered by a jury; he may instruct them to reconsider it, and if on reconsideration they bring in a different verdict, that last tendered is their true verdict. In criminal cases defects of imperfect statement of averments in support of indictments are cured by the verdict. It is within the power of

the judge at the trial of a civil action to enter judgment *non obstante veredicto* if the finding appears to him substantially contradictory to law, and it is a question for the appellate court whether a verdict is so much against the weight of evidence as to give occasion for a new trial. A verdict is called perverse where the jury refuse to follow the judge's direction as to the law. In Scotland a verdict may be the verdict of the majority of fifteen jurors in a criminal case, but in civil cases the jury of twelve must deliberate three hours before they may deliver a majority verdict. In criminal cases the verdict should be 'guilty' or 'not guilty.' The verdict of 'not proven,' in Scotland, has the same legal effect as that of 'not guilty.' In civil trials, when the jury are equally divided the juror first sworn has a casting vote. Special verdicts are very uncommon in Scotland. For the verdict at an inquest see CORONER.

Verdigris, a mixture of basic acetates, prepared by the action of crude acetic acid on copper. It varies from blue to green, and is used as a pigment.

Verditer, a basic carbonate of copper, prepared by precipitating copper sulphate or oxychloride with sodium carbonate. It has a small application as a blue or green pigment, but is poisonous and liable to discoloration.

Verdun (anc. *Verodunum*), tn. and fortress of the first class, dep. Meuse, France, on r. bk. of Meuse, 35 m. by rail w. of Metz; has manufactures of hardware, leather, machinery liqueurs, and confectionery. It has a 12th-century cathedral. Here in 843 was signed the compact which divided the kingdom of the Franks into three parts, and so gave rise to the future France, Germany, and Lorraine. Pop. 21,700.

Vere, SIR AUBREY DE. See DE VERE.

Vere, AUBREY THOMAS DE. See DE VERE.

Vere, SIR FRANCIS (1560-1609), English soldier, born probably at Cropping Hall, Essex. He fought in Holland under the Earl of Leicester (1585), and was knighted by Lord Willoughby (1588). Succeeding to the chief command (1589), Vere gained further distinction at Breda (1589) and Zutphen (1591). He took part in the Cadiz expedition (1596) and the islands voyage (1597). Back in Holland, he distinguished himself at Turnhout (1598), Nieuwpoort (1600), and Ostend (1601). He spent his last years in writing his *Commentaries*.

Vere, SIR HORACE (1565-1635), brother of the above, took part in the campaigns from 1590 onwards, was knighted at Cadiz (1596), surrendered Mannheim (1622), and was created Baron Vere of Tilbury (1625). See *The Fighting Veres*, by Sir Clements R. Markham (1888).

Vere, ROBERT DE, NINTH EARL OF OXFORD AND DUKE OF IRELAND (1362-92), a favourite of Richard II., and much mixed up with the history of his reign.

Vereeniging, tn., Transvaal prov., S. Africa, 36 m. s. of Johannesburg, on the bank of the Vaal, where peace was agreed upon between Boers and British (May 31, 1902). A dam on the Vaal here provides irrigation for a large tract of country. Coal is mined in the vicinity. Pop. 1,000, about half of whom are whites.

Verestchagin, VASSILI (1842-1904), Russian military painter, born at Cnerepovets in gov. Novgorod; studied under Gérôme in Paris. He was present with the Russian troops in the war against Bokhara (1867), and in the Russo-Turkish war of 1877; was in the Shipka Pass and at the siege of Plevna; and was secretary to

General Skobelev during the negotiations of peace at San Stefano. Thereafter with the brush he preached peace by painting such terrible subjects as the *Pyramid of Skulls* and *The Street of Plevna*. In spite of his French training he remained Russian in outlook, and in fullness and crudeness of colour. After the publication of Tolstoi's *War and Peace* he struck out a new style of work by following the author's method. His autobiography has been translated into English (1887). Verestchagin perished in the *Petropavlovsk* outside Port Arthur on April 4, 1904. See *Life*, in German, by Zabel (1900).

Verga, GIOVANNI (1840), Italian novelist, was born at Catania in Sicily. He began with novels, which were reminiscent of French sensational fiction—e.g. *Storia di una Capinera* (1874), *Nedda* (1874), *Eros* (1875). In 1880 he found his true genre—simple tales, dealing with Sicilian village life, and presented with a truth and mastery that remain unrivalled (e.g. *La Vita dei Campi*, 1880). His *Cavalleria Rusticana* was arranged as a libretto for Mascagni's music (1890). In English have appeared *The House by the Medlar Tree* (with introduction by W. D. Howells, 1891); *Maestro Don Gesualdo* (1893); *Cavalleria Rusticana* (1893); *Under the Shadow of Etna* (1895).

Vergara, tn., Spain, prov. of Guipuzcoa, 22 m. W.S.W. of San Sebastian. Here was signed the agreement which terminated the Carlist War in 1839. Pop. 6,200.

Vergennes, CHARLES GRAY-IER, COMTE DE (1717-87), French statesman, was born at Dijon. After the war of the Austrian Succession, Vergennes was sent as the French representative to the court of the elector of Trèves. In 1754 he was appointed ambassador at

Constantinople, and incited the Turks to oppose Russian aggressions in Poland. In 1772 Vergennes aided in carrying out the *coup d'état* in Sweden, by which Gustavus III. made himself absolute. On the accession of Louis XVI. Vergennes was appointed (1774) successor to D'Aiguillon at the foreign office. The peace of Teschen in 1779, between Austria and Prussia, was a signal triumph of his firmness and sagacity. In 1785 he aided Holland against Joseph II., who had attempted, in defiance of treaties, to open the Scheldt. Pitt consented in 1786 to make with him the famous commercial treaty, which largely benefited both Britain and France. See Mayer's *Vie Publique et Privée du Comte de Vergennes* (1789).

Vergil. See VIRGIL.

Vergil, POLYDORE (?1470-?1555), Italian historian, born at Urbino. Becoming secretary to the Duke of Urbino at Padua, he wrote two well-known books, *Proverbiaiorum Libellus* (1498) and *De Inventoribus Rerum* (1499). After being chamberlain to Pope Alexander VI., Vergil came to England as sub-collector of Peter's pence (1501), and was made rector of Church Langton, Leicestershire (1503). He became prebendary of Nonington (1507); prebendary of Brent, and archdeacon of Wells (1508); was naturalized (1510); and appointed prebendary of Osgate, St. Paul's (1513). For offending Wolsey he was imprisoned for some months (1515). He edited *Gildas* (1525); published *De Prodigis* (1526); while his famous (Latin) *History of England* appeared in 1534. Vergil returned to Italy about 1551. See Ellis's preface to *History of England*, published (1844-46) by the Camden Society.

Vergniaud, PIERRE VICTORNIEN (1753-93), a chief of the Gironde, and one of the victims of Robespierre, was born at Limoges,

dep. Haute-Vienne, France. He was a man of oratorical gifts, but of an indolent habit, which masked the strength of his passions. Personally, he merged himself in the revolution. He was president at the condemnation of Louis XVI., and voted for his death. On May 31 to June 2, 1793, the Girondist party was overthrown; and in spite of Vergniaud's eloquence, which 'drew tears,' all the leaders were sentenced to death, and on October 31 brought to the guillotine. See Vatel's *Vergniaud* (2 vols. 1875), and *Life*, in French, by Verdère (1836).

Verhaeren, EMILE (1855). Belgian poet, born near Antwerp. With his first book, *Les Flamandes* (1880), he arrested attention by the energy and rush of his language, the force and colour, sometimes even by the brutal violence, of his pictures. These qualities were still further illustrated in *Les Flambeaux Noirs* (1890), *Les Campagnes Hallucinées* (1893), *Les Villes Tentaculaires* (1895), *Les Villages Illusoires* (1896), and *Les Forces Tumulueuses* (1901), all written in unrhymed verse. But a simpler style and more poetic themes are revealed in *Les Tendresses Premières* (1904) and *Les Heures d'Après-Midi* (1905). A selection of his *Poems* appeared in an English translation in 1899. Verhaeren has also written plays, *The Dawn* (Eng. trans. 1898), *Le Cloître* (1900), and *Philippe II* (1901). See Ramaekers's *E. Verhaeren* (1900).

Veria, tn., vilayet of Saloniki, Turkey, 40 m. w. of Saloniki. As Berrhûa it was one of the oldest towns of Macedonia, and here Paul preached in 54 A.D. The Turks call it Karaferia. Pop. 8,000.

Verkhone-Dnieperovsk, tn., Ekaterinoslav gov., S. Russia, 34 m. w.n.w. of Ekaterinoslav

city, near the Dnieper. Pop. 9,000.

Verkhone-Udinsk, tn., Transbaikalia, Siberia, on the Trans-Siberian Railway, 200 m. w. by s. of Chita. It has a large trade. Pop. 8,000.

Verkhone-Uralsk, tn., Russia, in Orenburg, 150 m. e.s.e. of Ufa. Pop. 11,000.

Verkhoyansk, tn., Yakutsk prov., E. Siberia, on Yana R., 400 m. n.n.e. of Yakutsk. It is noted as being at the pole of greatest cold in the Asiatic continent, with a mean winter temperature of -55° F. A temperature of -93° F. has been recorded here in February. In July the average temperature is about 69° F. Alt. 531 ft. Pop. 400.

Verlaine, PAUL (1844-96), French lyrical poet, born at Metz. His earliest volumes—*Poèmes Saturniens* (1866) and *Fêtes Galantes* (1869)—showed the influence of Baudelaire and his school. He then formed a friendship with Rimbaud, until a quarrel led Verlaine to aim a pistol at the other, for which he had to atone by two years' imprisonment at Mons. He left prison a devout Catholic. In 1881 appeared *Sagesse*, a series of religious odes and lyrics, which take rank with the best work of Christina Rossetti. *Romances sans Paroles* (1874), *Jadis et Naguère* (1884), *Amour* (1888), *Parallèlement* (1889), *Bonheur* (1891) were his most notable succeeding works, all characterized by exquisite beauty of thought and rhythm. See E. Lepelletier's *Paul Verlaine: His Life—His Work* (Eng. trans. 1909).

Vermeer, JOHANNES, or **JAN VAN DER MEER** (1632-75), Dutch painter, was born at Delft, and was greatly influenced by Pieter de Hoogh. His paintings are mostly portraits, *genre* pictures, landscape and town views. Examples are in Amsterdam, Ber-

lin, and Paris, and there is one at Windsor.

Vermejo. See **BERMEJO**.

Vermes, a term used by Linnaeus in zoological classification, now abandoned. See **WORMS**.

Vermicelli, an Italian paste made of the same materials as macaroni, but manufactured in long, slender, solid threads. It is much used as food both by itself and in soups.

Vermifuges, or **VERMICIDES**. See **ANTHELMINTICS**.

Vermillion, a variety of mercuric sulphide, HgS . It is prepared either by subliming the black sulphide obtained on heating sulphur with mercury or by a wet process. In the latter, which is more economical, but does not yield so fine a product, mercury and sulphur are gently heated in a solution of caustic potash, until the black sulphide first formed becomes converted into the red variety. Vermillion is a brilliant scarlet, very heavy solid, which when finely ground makes a beautiful and permanent pigment. It is commonly adulterated with ferric oxide, red lead, chalk, and gypsum; whilst 'vermillionettes,' which are chalk, etc., dyed with coal-tar colours, are sometimes substituted for it. Its purity can easily be tested by heating it, when it should completely sublime.

Vermiland or **KARLSTAD**, a s.w. gov. of Sweden bordering on Norway, and having Lake Vener on the s. Area 7,435 sq. m. Pop. (1911) 260,140. The cap. is Karlstad.

Vermont, one of the N.E. states of the United States of America, with an area of 9,564 sq. m., of which 440 sq. m. are water. It was admitted to the union in 1791. The surface is in the main mountainous, with fairly well defined ridges, known as the Green Mts., running nearly N. and S., the greatest height being Mt.

Mansfield (4,364 ft.). Connecticut R. flows along its e. boundary, and its w. boundary is in part made by Lake Champlain. The capital is Montpelier. Agriculture is the leading industry. Manufactures are not yet very important. Among the products are butter and cheese, paper pulp, flour, and lumber. The chief minerals are marble, granite, slate, and limestone. Pop. (1910) 355,956. See Wood's *History of Taxation in Vermont* (1904); and Robinson's *Vermont* (1892).

Vermouth, a liqueur prepared chiefly around Turin, N. Italy, and in France. The Italian variety is usually obtained by distilling bitter white vermouth wines and sweetening with loaf sugar. The cheaper qualities are made by macerating Pontic wormwood with grain spirit, pouring off the clear liquid, then adding orange wine and from 16 to 22 per cent. of sugar. In the French casenier vermouth a number of bitter aromatic herbs are used in addition to wormwood. The alcoholic strength averages about 19 per cent.

Vernal Grass, **SWEET**. See **GRASSES**.

Vernation, a term applied to the arrangement of the leaf within the bud of a plant. Commonly the leaf is rolled. Sometimes, however, as in the dock, rhubarb, and primrose, the vernation is 'crumpled;' or 'plaited,' as in the lady's mantle and wood sorrel. Yet other arrangements are seen in the rose, beech, hornbeam, and oak.

Verne, JULES (1828-1905), French author, was born at Nantes. In 1850 he produced a comedy in verse, *Les Pailles Rompues*; but he eventually confined himself to the writing of scientific and geographical romances, achieving a great success. Among these works were *Cinq Semaines en Ballon* (1863);

Voyage au Centre de la Terre (1864), *De la Terre à la Lune* (1865), *Vingt mille Lieues sous les Mers* (1870), *Le Tour du Monde en quatre-vingts Jours* (1873), *Michel Strogoff* (1876), *La Découverte de la Terre* (1878), *Mistress Bran'ca* (1891), *Cloris Dordentor* (1896), and *Les Frères Kip* (1902).

Verner's Law, in philology. So far as Grimm's law expresses the relations between Indo-European and early Teutonic consonants in words genealogically connected, its principal results may be exhibited as follows:—

Indo-European.	Early Teutonic.
<i>p, t, k</i>	<i>f, th, kh (h)</i>
<i>b, d, g</i>	<i>p, t, k</i>
<i>b-h</i> [φ]	<i>bh</i> [b]
<i>d-h</i> [θ]	<i>dh</i> [d]
<i>g-h</i> [χ]	<i>gh</i> [g]

B-h is *b+h*, whereas *bh* represents spirant *b*. (See PHONETICS.) The letters in brackets in the first column are the Greek modifications of the Indo-European aspirates, those in the second the Low German corresponding series. It was soon observed, however, that the Teutonic consonants *f*, *th*, and *h* by no means always corresponded to the Indo-European group *p, t, k*. In many cases the voiced spirants *bh, dh*, and *gh*, represented in Low German by *b, d*, and *g* respectively, took the place which Grimm's law assigns to *f, th*, and *h*. Verner's law, published in 1877, explains this by reference to the Teutonic word accent. When the syllable preceding the consonants in question is accented, Grimm's law applies; but where the accent falls on the following syllable, *f, th*, and *h* first become *bh, dh*, and *gh*, and finally, in Low German, *b, d*, and *g*. Thus Indo-European *t*, preserved in

Latin *tres*, becomes, according to Grimm's law, *th* in English *three*, but the Indo-European *t*, preserved in *altus*, by Verner's law becomes *d* in English *old*. Verner's law throws light on many of the consonantal changes in Teutonic verbal forms—e.g. Indo-European *k*, preserved in Latin *duco*, becomes *h*, according to Grimm's law, in German *ziehen*, but is represented by *g* in the participle *gezogen*. In English, modern phonetic change has largely obliterated the operation of Verner's law, but it is quite clear in Anglo-Saxon. This same law also accounts for the change of original *s* into Teutonic *z* (replaced in English by *r*). See Skeat's *Principles of English Etymology* (First Series, 1887), ch. ix., and Victor Henry's *Grammaire Comparée de l'Anglais et de l'Allemand* (1893).

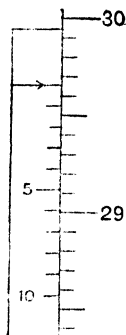
Vernet, a family of French painters. CLAUDE JOSEPH (1714-89) was born at Avignon. He painted the chief seaports of France.—ANTOINE CHARLES HORACE, his son, known as Carle Vernet (1758-1835), was born at Bordeaux. He won the Grand Prix de Rome in 1782, and in 1788 was elected a member of the Academy. He was widely known as an animal painter, and executed some large Napoleonic battle-pieces.—ÉMILE JEAN HORACE (1789-1863), his son, was born at Paris. He also was known for his battle-pieces—Jemappes, Valmy, Friedland, Wagram, Jena, Fontenoy; but produced also many *genre* pictures, Algerian and Biblical subjects, and portraits. He was director of the French School of Art at Rome (1828-35). See *Lives* of all three, in French, by Dayot (1898).

Verney, SIR EDMUND (1590-1642), standard-bearer (1626) to Charles I. He was returned to Parliament as member for Buckingham (1624), Aylesbury (1628),

and Chipping Wycombe (1640). Though voting against the king in Parliament, he joined the royalists on the outbreak of the civil war, and the royal standard was committed to his keeping (1642). After the battle of Edgehill (1642) his severed hand was still found grasping the standard.—SIR EDMUND (1616-49), his third son, served in the Scottish war (1639), and in Flanders and in Scotland (1440). With his father he fought for the king in the civil war, served in Ireland (1642), and was slain on the capture of Drogheda by Cromwell (1649).—SIR RALPH (1613-96), eldest son of Sir Edmund (1590-1642), was M.P. for Aylesbury (1610), and sat on Strafford's trial. He adopted the cause of Parliament in the civil war. Refusing to sign the Covenant (1643), he went abroad for ten years, and his estates were sequestrated (1643). On his return he was imprisoned by Cromwell (1655). At the coronation of Charles II. he received a baronetcy. As member of Parliament for Buckingham he withstood the attacks of Judge Jeffreys on electoral rights (1685). See *Verney Memoirs* (1892-9).

Vernier, an auxiliary scale, invented by Pierre Vernier (1580-1637), which enables us to read the very smallest divisions of a graduated scale. It is indispensable in theodolites, sextants, and all mountings of telescopes for accurate determination of angular positions; also in barometers, cathetometers, and other instruments for measuring length. The diagram shows how to find the exact height of a zero mark by a vernier scale. The right-hand scale represents inches and tenths, the left a scale with a zero mark and ten vernier divisions occupying a length of $\frac{1}{10}$ of an inch. It will be seen that, as the eye passes down the vernier from the zero mark, each

successive vernier line gets nearer to the corresponding scale line by $\frac{1}{10}$ of the small scale division—that is, by $\frac{1}{100}$ of an inch. At length we come to a line (the seventh in this case) which exactly corresponds with the line on the



Vernier.

scale. Hence we know that the zero line is $\frac{7}{10}$ (i.e. $\frac{7}{10}$ of an inch) above the scale line next below it. Thus the height of the vernier zero, which may be supposed to indicate the height of a barometer, is $29 + \frac{7}{10} + \frac{1}{100} = 29.67$ inches.

Vernon. (1.) Town, Tolland co., Connecticut, U.S.A., 18 m. E.N.E. of Hartford; manufactures woollen, cotton, and silk goods. Pop. (1910) 9,087. (2.) Commune, France, in Eure dep., on l. bk. of the Seine, 42 m. W.N.W. of Paris; manufactures chemicals, machinery, and trades in coal and stone. Pop. 8,600.

Vernon, EDWARD (1684-1757), English admiral, born in Westminster. In 1739 he was given command of an expedition against the Spanish possessions in S. America, and especially against Porto-Bello, which place he took with a very small squad-

ron. In 1745 he was promoted to be an admiral, but in the following year he was dismissed the service, on a charge of having published two pamphlets containing letters which he had received from the ministry and the Admiralty. He was an officer of bravery and ability, but of intolerant temper. He introduced into the navy the practice of serving out rum mixed with water instead of neat rum. The mixture became known as 'grog,' Vernon having gained the nickname of 'Old Grog' from his habit of wearing a groggier coat. See Ford's *Admiral Vernon and the Navy* (1937).

Verocchio. See VERROCCHIO.

Verőcze, tn., Hungary, in Slavonia, 45 m. w.s.w. of Fünfkirchen. Pop. 7,699.

Verolamium, or VERULAMIUM, the Latin name of an ancient British city, probably the residence of Cassivelaunus, which Julius Caesar captured. It is now Old Verulam, near St. Albans in Hertfordshire.

Verona, fort. city and cap. of prov. of same name, Venetia, Italy, on the Adige, 72 m. by rail w. of Venice; has manufactures of nails, pianos and organs, cotton and silk goods, paper and flour, and trade in fruit, wines, and marble. The Gothic cathedral dates from the 12th century, and contains a fine *Assumption* by Titian; the very fine Romanesque church of San Zeno Maggiore (rebuilt in the 12th cent.) stands in the w. corner of the city. Verona was originally a Celtic foundation, but became a Roman colony with the title of Augusta. It was the birthplace of the poet Catullus. In the later empire it was often a residence of the court; Theodoric used to stay there. It possesses a Roman amphitheatre, in an almost perfect condition; also a few remains of a theatre, an ancient gate,

and wall of Gallienus, erected in 265 A.D. Pop. (comm.) 75,000. The province has an area of 1,185 sq. m., and an estimated population (1910) of 450,000. See Wiel's *The Story of Verona* (1902).

Veronese, PAUL, the cognomen of PAOLO CAGLIARI (1528-88), Venetian painter of processional, ceremonial, and festival pictures, born in Verona. He settled in Venice in 1555. Through Titian's influence the Senate commissioned him to assist in decorating the ducal palace (destroyed in the fire of 1579). His greatest work is the decoration of the church of S. Sebastiano. The Venice Academy, the Brera, Madrid, Turin, Vienna, Dresden, Munich are rich in his work, while the National Gallery, London, owns among others his most representative picture, *Family of Darius before Alexander*. Veronese stands in the forefront of great colourists. He had all the joyous grasp on the aspects of life that characterized the Venetians, but preserved throughout the silvery tones of the Veronese school. See Cagliari's *Paolo Veronese* (1888), and *Modern Painters*, by John Ruskin.

Veronica, a genus of herbaceous and shrubby plants, belonging to the order Scrophulariaceae. The flowers are usually borne in axillary or terminal racemes, and range in colour through the blues, purples, and white. Several species occur native in Britain, notably the beautiful blue-flowered germander speedwell, or bird's eye (*V. chamædrys*). Other British species are the decumbent *V. officinalis*, which bears slender racemes of lilac flowers in summer; and *V. scutellata*, which bears spikes of bright blue flowers in August.

Veronica. One of the women of Jerusalem who followed Jesus on his way to crucifixion (Luke

23:27), taking pity on His fainting condition, wiped the sweat from His face with her handkerchief. The napkin is said to have retained the imprint of the Holy Face, and has been preserved since the year 700 in St. Peter's at Rome. Its possession has also been claimed by Milan and other places. The name is said to be a corruption of *vera icon*, 'true image.'

Verres, GAIUS, Roman administrator. In 82 B.C. he was quaestor. In 74 he was city praetor, and then governed Sicily for three years (73 to 71 B.C.). Apart from his tyranny and oppression, his rapacity was such that he is said to have done more harm to the island than the two slave wars or the old war between Carthage and Rome. Every statue or object of art of any value was seized by him. On his departure the Sicilian people besought Cicero to prosecute him for extortion. He was condemned, and retired to Marseilles, and in 43 was proscribed by Mark Antony, who was envious of his art treasures. See Cicero's *Verrine Speeches*.

Verri, ALESSANDRO, COUNT (1741-1816), Italian writer, was born at Milan. He settled at Rome in 1767. He wrote novels based on the lives of Sappho and Herostratus, the *Vicende Memorabili de' suoi Tempi* (ed. 1858), and, above all, the *Notti Romane al Sepolcro degli Scipioni* (1792; 2nd ed. 1804), a glorification of Rome (Eng. trans. 1825). Verri's best works appeared as *Opere scelte* at Rome in 1822, with biography by Maggi.

Verri, PIETRO (1728-97), Italian writer, brother of the foregoing, was born at Milan. Besides contributing to *Il Caffè*, he wrote *Meditazioni sull'Economica Politica* (new ed. 1833), with monograph by Ferrara. He also wrote the history of his native city to the year 1864 (continued by

Frise, Custodi, and Magri, 1783-98), a work still highly esteemed. Editions of Verri's selected works appeared at Milan (1835), with biography by Custodi; and at Florence (1837), under the care of Carcano, with biography by Salvagnoli. An admirable monograph is that by Bouvy (1890). See too the brothers' *Lettere e Scritti Inediti* (ed. by Casati, 1879-80).

Verria. See BERGIA.

Verrocchio, ANDREA DEL (1435-88), the name assumed by Andrea de' Cioni, Florentine goldsmith, sculptor, architect, and painter; worked under Donatello. In 1471 he executed in bronze, for the sacristy of San Lorenzo, the mausoleum of Giovanni and Pietro de' Medici; and in 1476 *Young David*, now in the National Museum of Florence. Among his other works are the bas-relief of the *Decapitation of John the Baptist*, the bronze equestrian statue of Colleoni (at Venice), the silver altar in the baptistry of San Giovanni, the group of the *Unbelief of St. Thomas* in the oratory of San Michele, and the tomb of Bruni in Santa Croce. His most celebrated pupil was Leonardo da Vinci. See Maud Cruttwell's *Verrocchio* (1904).

Versailles, French tn., dep. Seine-et-Oise, 11 m. W.S.W. of Paris. It is essentially a show place, and its great sight is the famous palace of Louis XIV., said to have cost £40,000,000, surrounded by imposing but stiff and artificial grounds. The palace contains pictures by Boucher, Vanloo, Watteau, David (illustrating Napoleon's career), Delacroix, and Vernet. Here Marie Antoinette faced the raging mob of the revolution in 1789; here, in 1871, William of Prussia was proclaimed German emperor; and here, in the same year, the capitulation of Paris was signed. The town, of a grandiose char-

acter, is very regularly and conspicuously laid out, and is the seat of a bishopric. In Versailles were born Louis xv., Louis xvii., and Louis xviii., Generals Hoche and Borthier, and the Abbé de l'Épée. Pop. (comm.) 55,000. See Noliac's *Versailles and the Triansons* (1903); Farmer's *Versailles and the Court under Louis xiv.* (1906); and Bertrand's *Versailles* (1906).

Verse, the principal unit by which metrical compositions are measured. Generally speaking, it is equivalent to what we term commonly the line. The elementary unit of metrical compositions is the 'foot'—i.e. a little group of one or more syllables measured either by accent or by quantity. The verse in turn consists of a certain number of these feet grouped in definite order, on the conclusion of which the writer turns back and repeats the same or a closely related group. As the following verse or verses may vary slightly from the original pattern, so as to form what is strictly termed a stanza, the word verse is sometimes stretched to cover this more elaborate grouping, which is then taken as the principal metrical unit. This application of the term is, however, an inadmissible usage. Further, verse is commonly considered as synonymous with metre in general, and as the antithesis to prose, in which the rhythm of the language is not restricted according to any prearranged pattern. And by a not unnatural confusion of thought, a still further extension of the term makes it equivalent to poetry and the poetical. But verse is only an accidental accompaniment of poetry. Nevertheless, it is certainly true that poetry instinctively assumes a metrical form and expresses itself in verse. In what way, then, does verse aid in the expression

of the poetical? It does so by establishing a certain definite form of rhythm, and thus apprising the hearer beforehand of the particular musical effect he is to look for. We naturally expect in imaginative or emotional speech a rhythm elevated above that of common life, and in imaginative prose this elevated rhythm is so extremely varied in character that the mind is kept constantly on the alert to catch it. In fact the strain on the attention is so great that prose cannot long remain at this height without becoming wearisome. In verse, on the other hand, this variety of cadence is restrained within clearly defined limits, and the mind is enabled to concentrate its attention on the subtle changes of harmony within those limits. The grammatical rules for quantity and accent, and the laws of versification, are known as prosody. See **POETRY**.

Versecz, tn. and episc. see, Temes co., Hungary, 45 m. by rail s. of Temesvár; has sawmills and breweries, and is noted for red wine and brandy. Pop. 22,000.

Verst, a Russian measure of length, equal to 663 of an English mile.

Vertebrates, or back-boned animals, as first defined by Lamarck, are those in which there is a dorsal axis, consisting of a chain of vertebrae. But the term chordates is preferable, because it is the notochord, not the backbone, which is the supremely important structure; but as vertebrate is a well-established term, it is customary to use it as synonymous with 'chordate.'

Vertigo, or the sensation of giddiness, is a disturbance of the function of equilibration or balancing. The more common causes of the condition are associated with disorders of the eyes and ears. Ocular vertigo is frequently due to a slight squint. Auditory vertigo (synonym,

Menière's disease), or labyrinthine vertigo, is the result of derangement of the semicircular canals of the ear. Vertigo, however, may be due to central nervous disorder, and to derangements of the digestive system. The giddiness associated with sea-sickness is one of the most distressing features of that affection. Severe hæmorrhage or any other condition which produces cerebral anæmia is apt to cause vertigo, which also follows the use of certain drugs, as tobacco, alcohol, and quinine. Treatment must depend entirely upon the cause.

Vertou, comm., France, in Loire-Inférieure dep., on the Sèvre, 4 m. E.S.E. of Nantes. Pop. 5,400.

Vertue, GEORGE (1684-1756), English antiquary and engraver, born in London. While working under Sir Godfrey Kneller he achieved fame as an engraver, and in 1730 issued his set of *Twelve Heads of Poets*. After his death his antiquarian notes were bought by Horace Walpole, and were extensively used by him in compiling his *Anecdotes of Painting in England* (1762-71).

Verulam, tn., cap. of Victoria co., Natal, 18 m. N.E. of Durban; is a centre of the sugar industry. Pop. 1,400 (400 whites).

Verulam, BARON (1561-1626). See BACON, FRANCIS.

Verus, LUCIUS AURELIUS, the colleague of Marcus Aurelius in the empire from 161 to 169 A.D., was adopted by Antoninus Pius. Verus, however, was of an indolent and pleasure-loving nature, and did not aid M. Aurelius greatly, though from 162 to 165 A.D. he carried on a successful war against the Parthians. Afterwards he fought against the Quadi in the Marcomannic war.

Verviers, tn., Liège prov., Belgium, near the German frontier, 14 m. E.S.E. of Liège; long noted for woollens, and has

manufactures of woollen yarn and glass. Pop. 48,000.

Vesalius, ANDREAS (1514-64), Flemish anatomist, 'the first author of a comprehensive and systematic view of human anatomy,' was a native of Brussels, and studied at Louvain, Montpellier, and Paris. At the age of sixteen he became professor of anatomy at Louvain, in 1540 at Padua, and in 1543 at Bologna, from which he passed to Pisa. In 1544 he was appointed physician to Charles V., and afterwards to Philip II. of Spain. Troubled with a painful malady, in expiation of a vow he made a pilgrimage to the Holy Land, and on his way back he was shipwrecked on the island of Zante, where he died of hunger and hardship. His great work is *De Corporis Humani Fabrica* (1543). His *Opera Omnia* were edited by Boerhaave and Albinus (2 vols. 1725). See Burgeraeve's *Etudes sur André Vésale* (1841), and *Life*, in German, by Roth (1892).

Vesicants. See BLISTER.

Vesicaria, a genus of herbaceous plants belonging to the order Cruciferae. They bear mostly large yellow or purple flowers.

Vésinet, LE, comm., France, in Seine-et-Oise dep., near the Seine, 9 m. N.W. of Paris. Pop. 5,700.

Vesoul, tn., France, in Haute-Saône dep., 33 m. W. of Belfort; manufactures files, and has distilleries. Portions of its mediæval walls still exist. Pop. (comm.) 10,000.

Vespasian (9-79 A.D.), whose full name was Titus Flavius Sabinus Vespasianus, emperor of ancient Rome from 69-79 A.D., was born near Reate in the country of the Sabines. In 43 he commanded the second legion under Aulus Plautius in Britain, and reduced the Isle of Wight (about 47 A.D.). In 51 he became consul, and was proconsul of Africa under Nero, and in 66

governor of Judæa. In 69 Vespasian was proclaimed emperor at Alexandria by his own troops. The first events of his reign were the suppression of the revolts of the Batavians, the Gauls, and the Jews. The capture of Jerusalem by Vespasian's son Titus, in 70, ended the last rebellion; and after his return to Rome and his joint triumph with his father, the temple of Janus was closed; Vespasian had restored peace to the Roman world. In his reign the conquest of Britain was continued; the dependent kingdom of Commagene was united to the province of Syria; and M. Ulpian Trajanus, father of the emperor, repelled a Parthian invasion of Syria. Vespasian's great task was to restore the finances of the state; he also found money for the new temple of Jupiter on the Capitol, a magnificent temple of Peace, and the vast Flavian amphitheatre commonly known as the Colosseum. But he was forced to increase existing taxes, and to introduce new ones, and so was accused of avarice and parsimony. Personally he set a noble example of simplicity and economy in his own living. In fact his reign began a new era of the empire: the old Julian line with its magnificence had gone, and the new emperors were content to live as citizens. See Henderson's *Civil War and Rebellion in the Roman Empire* (1908).

Vespers (Lat. 'evening'), or EVENSING, the sixth and second last of the canonical hours in the Anglican, Roman Catholic, and Greek Church services. See BREVARY.

Vespucci, AMERIGO (1451-1512), whose name was conferred on America, was born at Florence. In 1496 he was sent to Seville as factor for a mercantile firm. Interested in Columbus's third venture, he sailed across the Atlantic in 1499, exploring the

coast of Venezuela. In 1503 he discovered All Saints' Bay, Brazil. In 1508 he was made pilot-major of Spain.

Vessels, DISEASES OF. Arteriosclerosis.—It has long been recognized in a general way that the state of the vessels is of paramount importance in medicine, this being reflected in the trite saying that a man is as old as his arteries. It is only in recent years, however, that the full significance of this has been realized. This has come out largely as the result of newer methods of gauging the state of blood pressure for clinical purposes, by means of the various forms of sphygmometer recently introduced for this purpose. Briefly, a sphygmometer consists in a broad leather band with an air cushion on the inner surface, and a rubber tube, connected with the air cushion on the one hand, and with the other a column of mercury in an upright graduated glass tube. This band is applied over the upper arm, and the air cushion is gradually filled so as to obliterate the brachial artery, the finger on the radial artery noting the time at which the pulse becomes obliterated. The glass column is graduated to mark a pressure up to nearly 300 millimetres of mercury. Under normal conditions the pulsation in the radial artery can be obliterated by a pressure equivalent to from 100 to 120 millimetres of mercury; but in various diseased states, and more especially in diseases accompanied with altered state of the blood-vessels, the pressure may require to be enormously increased, rising up to 250 or 300 millimetres. The importance of this will be obvious when we recognize, firstly, the enormous increase in the amount of work thrown upon the heart to pump the blood against such a resistance; and, secondly,

the resulting increased liability for some of the blood-vessels to rupture under the increased pressure. It is such patients that succumb, as a rule, to cerebral hæmorrhage (apoplexy). The disease of the blood vessels, *par excellence*, is arterio-sclerosis. This consists in a gradual loss of elasticity of vessel, accompanied by a thickening of its coats, partly due to overgrowths of fibrous tissues, and partly to hypertrophy of its muscular fibres. This disease is insidious in its origin, and is attended by far-reaching serious effects, notably in the heart, kidneys, and brain. The heart undergoes hypertrophy in order to cope with the increased amount of work required, and sooner or later it dilates from the failure of this process of compensation. Coincidentally, the kidneys usually degenerate from the associated diseases of the renal vessels, and the clinical condition is aggravated by the association of chronic kidney disease. The brain also suffers from an impaired blood supply from the associated disease of its vessels, and the later occurrence of cerebral hæmorrhage. In addition, emphysema of the lungs and chronic bronchitis are frequent complications. The manifestations of arterio-sclerosis are thus of the most protean character, and it ranks at the present time as one of the commonest and most important morbid diseases. Its causes are manifold. There is often a hereditary weakening in the structure of the vessels. Otherwise the most important causes are the poisonous effects of alcohol and tobacco, both of which are, in other than very moderate amounts, powerful vessel poisons. Overeating, constipation, and a life of strain, whether physical or mental, are other causal factors. The enumeration of the causes gives the clue to successful treatment.

Above all, it is important to recognize the disease in its earlier stages, as prevention is easier than cure. Only too often the condition is not recognized until the patient's state is one of serious heart or kidney disease, the late sequelæ of arterial sclerosis, for which comparatively little can be done.

Vessels, SPECIAL TYPES OF. See BOAT; FERRY; ICE-BREAKER; OIL VESSEL; TURBINES; STEAM YACHTS; also FLOTATION.

Vesta, the fourth and brightest asteroid, discovered by Olbers on March 29, 1807. It revolves in a period of 1,326 days, at a mean distance from the sun of 219 million miles. Vesta alone among the asteroids is visible to the naked eye, although its diameter is only 250 miles (Bamond), less than that of Ceres or Pallas. Consequently its albedo must be greater than that of any other planet, nearly equal to that of white paper.

Vesta, in ancient Roman mythology, the goddess of the hearth, corresponding to the Greek Hestia. As the goddess of the home life her temple stood in the Forum, and contained the sacred fire which Æneas was believed to have brought from Troy. This fire was watched by the vestals: if by any mishap it was allowed to go out, it could only be relighted by the *pontifex maximus*, through the friction of two pieces of wood. These two features of the vestal worship, and the further one that the vestal virgins had always to fetch water from a spring outside the temple (water was never laid on inside) point to the origin of the cult. The *pontifex maximus* represented the headman of the primitive tribe, whose daughters' duty it was to keep the fire ever burning, the water ever pure, and to see to all other domestic comforts. The

official relations of pontifex and vestals prolonged the father-and-daughter relationship, so that when Christianity without a goddess came in, the church soon realized that Mariolatry was a necessity if the peoples were to be won to the new creed. The Vesta worship, however, survived in all its original simplicity till about 390 A.D., when the Emperor Gratian confiscated all its property. See W. Warde Fowler's *Roman Festivals* (1908); J. G. Frazer's *Golden Bough* (new ed. 1911), and article in *Journal of Philology* (1895), vol. xiv. 28.

Vestals, or VESTAL VIRGINS, maidens who at ancient Rome guarded the temple of Vesta and its sacred fire. Their institution is referred to Numa, who appointed four, a number afterwards raised to six, and never altered. Their period of service lasted for thirty years, during which they were bound by a vow of chastity. After the period was over they could renounce their vows, return to the world, and marry. Wills were entrusted to their keeping, and even treaties. But a lapse from chastity was punished by burial alive. Their institution ended in 394 A.D., when Theodosius II. closed the temple. See VESTA.

Vestanfors, comm., Vestmanland gov., Sweden, 90 m. W.N.W. of Stockholm. Pop. (1911) 6,109.

Vesterås, tn., cap. of Swedish gov. of Vestmanland, on a branch of Lake Mälär; has a cathedral dating from 1300, a castle, and a bishop's palace. Here, on April 29, 1521, Gustavus Vasa and his Dalecarlians defeated the Danes. Pop. (1911) 19,147.

Vesterbotten, a N. gov. of Sweden, extending along the Gulf of Bothnia to the Norwegian border. Area, 22,750 sq. m. Pop. (1911) 161,372. Cap. Umeå.

Vesternorrland, a gov. of Sweden, bordering on the Gulf of

Bothnia. Area, 9,840 sq. m. Pop. (1911) 250,517. Cap. Hernösand.

Vestervik, tn. and port, Kalmar gov., Sweden, 125 m. S.S.W. of Stockholm. In 1910 it exported 870,031 tons of iron ore. Pop. (1911) 9,970.

Vesting Order, an order generally made by a judge of the Chancery Division; its effect is to vest real or personal property in the persons named in the order without the operation of a conveyance or assignment. It is usually employed in cases where trustees are appointed by order of the court, and it is impossible to convey the estate to them in any ordinary way. The procedure is under the Trustee Act, 1893. The judge in lunacy may also vest the lunatic's property in his committee under the Lunacy Act, 1890, and the Charity Commissioners can make vesting orders under the Charitable Trusts Acts. Vesting orders may also be made in bankruptcy.

Vestmanland, inland gov. of Sweden, to the W. of Upsala gov. Area, 2,620 sq. m. Pop. (1911) 155,925. Cap. Vesterås.

Vestments. The clerical vestments which were worn throughout the whole church until the reformation, and which are to a certain extent in use in the Anglican Church, were probably derived from the ordinary dress of Romans and Orientals. Thus the alb is the ancient tunic; the dalmatic was used by the Roman emperor; so also the cope, and so on. The *Rationale of the Ceremonies to be used in the Church of England, with an Explanation*, by Archbishop Cranmer, explains the vestments in use at the celebration of the Holy Eucharist. When renewed interest in the ritual of the church was excited in 1830, certain ritualists adopted the chasuble over an alb, their action gaining apparent support from a decision of

the Judicial Committee of the Privy Council in 1857, that 'the same dresses which were used under the first Prayer Book of Edward VI. may still be used.' Much litigation followed. In 1870 Sir R. Phillimore gave judgment in similar terms to that of 1857; his decision was, however, reversed by the Privy Council in 1871. It was then, and again in 1877, declared that all vestments except the surplice were illegal in the Church of England. This pronouncement has been considerably modified by the declaration of the archbishop of Canterbury in the case of the bishop of Lincoln (Dr. King). (See LINCOLN JUDGMENT.) Vestments prescribed by canon to be worn by officiating clergy are often termed canonicals.

Vestra Vingåker, comm., Sweden, in Södermanland gov., 79 m. w. by s. of Stockholm. Pop. (1911) 8,318.

Vetralla, tn., Italy, 38 m. N.W. by N. of Rome. Pop. (comm.) 8,000.

Vestry, the meeting of the inhabitants of a parish for the election of parish officers and the settlement of parish affairs. In a few parishes there is a custom to elect vestrymen to represent the parishioners, thus forming what is called a select vestry. Under 1 and 2 Will. IV. c. 60, which is an adoptive act, parishes having at least 800 ratepayers were enabled to obtain a select vestry. There are said to be only eight parishes where this act is in force. In all rural parishes the non-ecclesiastical powers of the vestry have been transferred to the parish council, or the parish meeting, by the Local Government Act, 1894. In the county of London, in which vestries were in many cases the local authority, they have been superseded by the borough councils

under the London Government Act, 1899.

Vesuvianite. See IDOCRASE.

Vesuvians. See MATCHES.

Vesuvius, a volcano in Italy, S.E. of Naples. Its height is 4,020 ft. In 340 B.C. the decisive battle between the Romans and the Latins was fought probably on its northern slopes; in 73 B.C. Spartacus and his fugitive slaves made it their stronghold. On Aug. 21, 79 A.D., it broke into the eruption (described in a letter of Pliny the Younger to Tacitus) which overwhelmed Herculaneum, Pompeii, and Stabiae. In this eruption Pliny the Elder perished at Stabiae. Other eruptions took place in 203, 472, and 512 A.D. In 1611 the mountain was covered by forest, and even the crater was overgrown with shrubs, but these were swept away by an outbreak in 1631. In the 18th and 19th centuries its activity was much greater, especially in the years 1766, 1779, 1794, 1822, 1855, 1871, and 1906, when roofs fell in through the great weight of the ashes upon them at San Giuseppe (killing eighty people) and at Naples; the village of Ottajano was also destroyed and abandoned. Observations have been kept upon the mountain from an observatory built at the foot of the crater in 1844, and conducted from 1854 to 1882 by Professor Palmieri, and now by Professor Matteucci. Since 1880 a wire-rope railway has carried visitors close to the edge of the crater. The grapes grown on its slopes produce excellent wine—e.g. *lachrymæ Christi* and *vino greco*. See Palmieri's *Il Vesuvio e la sua Storia* (1880), J. S. Lobley's *Mount Vesuvius* (1889), and Lytton's novel *The Last Days of Pompeii*.

Veszprim, cap. of prov. of same name, Hungary, 69 m. S.W. of Budapest; has coal mines and

iron works. It has a castle and an episcopal palace; its Gothic cathedral dates from the 16th century. Pop. 14,000.

Vetch, or **LARK** (*Vicia sativa*), a leguminous plant of creeping habit, furnished with tendrils, and largely cultivated for fodder. It is indigenous to Britain, and is closely allied to many wild species, such as *V. sylvatica*, wood vetch; *V. cracca*, tufted vetch; *V. lutea*, yellow vetch. The plant thrives best upon chalky or calcareous soils, but is also well adapted for clays, as it can be folded by sheep during the dry season of the year. By distributing the sowings a succession may be kept up from May to October. Vetches are occasionally ploughed in as green manure.

Veterinary Science. The founder of veterinary medicine was the Roman writer Vegetius, who lived about 300 A.D. France founded the first veterinary college at Lyons in 1761, and the second at Alfort, near Paris, in 1766. The Royal Veterinary College in London was founded in 1790 by St. Bel, a Frenchman. In Edinburgh Professor Dick established a college in 1823, which in 1906 was incorporated in the Royal (Dick) Veterinary College, and in 1831 the Glasgow Veterinary College was founded; while quite recently veterinary colleges have been instituted in Dublin and in Liverpool. With the exception of the Dublin College, the British schools receive no state aid. The course of study in these schools extends over four years. Four professional examinations must be passed (one at the end of each period of study) before the degree can be obtained. The Council of the Royal College of Veterinary Surgeons (a body elected by the profession) conducts all professional examinations, grants degrees (M.R.C.V.S. and F.R.C.V.S.), manages the in-

ternal politics of the profession, and maintains discipline among its members. The degree of fellowship may be obtained by graduates after being five years in practice, on passing a special examination. Veterinary medicine and surgery became recognized as a profession in 1844, when the Royal College of Veterinary Surgeons obtained its charter of incorporation. The Highland and Agricultural Society of Scotland granted veterinary certificates in Scotland, enabling graduates to practise in that country prior to 1881, when the Veterinary Surgeons Act was passed. In July 1900 holders of the Highland and Agricultural Society's certificate were, by the Veterinary Surgeons Amendment Act, made amenable to the rules and regulations of the Royal College of Veterinary Surgeons. The proper inspection of meat and milk for human food, the housing and general sanitary condition of domesticated animals, the treatment of their diseases, the eradication of animal plagues, all require the skilled attention of veterinary surgeons. See further **CATTLE**, **HORSE**, **PIG**, **SHEEP**—*Diseases*.

Veterinary Service. The Army Veterinary Corps consists of 164 officers and 223 men. It is controlled by a director under the quartermaster-general. The veterinary service was first organized in the early part of the 19th century, when a veterinary surgeon was appointed to every regiment of cavalry and a few to the artillery. Subsequently a departmental organization was created, the regimental system existing simultaneously. In 1878 all regimental veterinary surgeons were incorporated in the department. At present a veterinary executive officer is attached to every cavalry regiment and mounted corps or other organiza-

tion of the regular army. Certain veterinary officers are also employed at the remount depôts. A veterinary school exists at Aldershot.

Farriers.—Men of each mounted unit are always under instruction as shoeing smiths. The majority go through a six weeks' course at the veterinary school. They can rise to the rank of farrier-quartermaster-sergeant. A cavalry regiment has 22 farriers and shoeing smiths; a field battery has 5. Shoeing smiths are also instructed in carriage smiths' work. Certain infantry soldiers are taught cold-shoeing.

Veto, THE. The power of vetoing legislation passed by both houses of Parliament still theoretically resides in the sovereign of Great Britain, but it has not been exercised since 1707, when Queen Anne refused her assent to a bill for settling the militia in Scotland. The president of the United States is, by the constitution, vested with a direct veto. If he disapproves of a measure, he returns it, with a statement of his objections, to the house in which it originated. A meeting of the two houses is then held, and if the bill is passed by a two-thirds majority it becomes law. If it fails to obtain this majority, the bill is dead for the session. The French president cannot veto bills. For the power of veto possessed by the separate magnates of Poland, the exercise of which was one of the causes of that country's ruin, see POLAND.

Vetter, or WETTER, LAKE, Sweden, 75 m. long, 10 to 20 m. broad, 400 ft. deep, and 740 sq. m. in extent. It lies 280 ft. above sea-level, and is remarkable for frequent and sudden perturbations of its surface, and for its periodical rising and falling, its numerous currents, its mirages, its extraordinarily deep, cold,

clear blue water, and its romantic shores. It is drained by the Motala, and is joined to the Baltic by the Göta Canal.

Veillot, LOUIS (1813-83), French journalist, editor, and author, was born at Boynes, dep. Loiret. After a visit to Rome in 1838 he returned to France an ardent supporter of Ultramontanism. As editor of the *Univers* he became the champion of the church. In 1842 he was made chief secretary to the minister of the interior. The *Univers* was suppressed from 1855 to 1867, owing to its attacks on Napoleon III. Veillot, among other writings, produced *Mélanges Religieux, Politiques, Historiques, et Littéraires*, in 18 vols. (1857-75).

Vevey (Ger. *Vivis*), tn., Switzerland, canton Vaud, on the N.W. shore of the Lake of Geneva, 12 m. E.S.E. of Lausanne, is a tourist resort. The manufactures include chocolate, infants' food, watches, machinery, and tobacco. The church of St. Martin contains the tomb of the regicide Ludlow, who died here in exile. Vevey is the scene of Rousseau's *Nouvelle Héloïse*. Pop. (1910) 13,596.

Vexatious Indictments. The Vexatious Indictments Act, 1859, which does not apply to Scotland, limits the common law right of prosecution by private persons for criminal offences. The act, as extended by later acts, provides that no indictment may be presented against any person for perjury, subornation of perjury, conspiracy, false pretences, keeping a gambling house or a disorderly house, indecent assault, libel, offences under Part II. of the Debtors Act, 1869, the Criminal Law Amendment Act, 1885, and the Merchandise Marks Act, 1887, unless the person presenting the indictment has made his charge before a court of summary jurisdiction, and has been bound over to prosecute, or the person ac-

cused is in custody or on bail, or unless the indictment is by order of a judge.

Vexiö, or VÄXJÖ, tn., cap. of Swedish gov. Kronoberg, 60 m. w. by N. of Kalmar, at the N. end of Lake Vexiö. Iron-founding and match-making are the chief industries. It has a cathedral dating from about 1300. Pop. (1911) 8,311.

Vezin, HERMANN (1829-1910), American actor, was born in Philadelphia, U.S.A. He first appeared on the English stage at York in 1850, and in London in 1852, at the Princess Theatre, in the character of Pembroke (*King John*). His name was principally associated with Shakespearean parts, though he also made his mark as Dr. Primrose and Percy Pendragon. He was the author of *My Masters*, and was a successful teacher of elocution.

Viadana, tn., Italy, prov. of and 20 m. S.W. of Mantua. Pop. tn. 5,000; comm. 16,000.

Viadana, LEOVICO (c. 1565-1645), whose real name was L. Grossi, Italian musical composer, born at Viadana, near Mantua. He successively held the appointments of musical director in the cathedrals of Mantua, Fano, Venice, and Mantua again. He was the first to employ thorough-bass in church music, was the inventor of the term *basso continuo*, and was one of the earliest composers of the monodic school, who used figured bass in writing instrumental accompaniments to vocal compositions.

Viaduct. See BRIDGE.

Via Mala, picturesque gorge of the Rhine, near Thusis, canton Grisons, Switzerland, is 4 m. long. The road and the river intertwine between limestone rocks some 1,600 ft. on either side. The first road was made in 1470; the present road, constructed 1818-24, forms the first part of the Splügen road.

Vianna do Castello, seapt., Portugal, on the Atlantic, at the mouth of the Limia, 38 m. N. by w. of Oporto. Pop. 10,000.

Viareggio, seapt. and health resort, prov. Lucca, Tuscany, Italy, on the coast, 13 m. by rail N.W. of Pisa; has a monument to Shelley, whose body was washed ashore (1822) and cremated here to allow of the interment of the ashes in the Protestant cemetery at Rome. Pop. (comm.) 22,000.

Viaticum, provision for a journey; a term used in the Roman Catholic Church for the last communion administered to those in *extremis*.

Viatka. See VYATKA.

Viau, or VIAUD, THÉOPHILE DE (1590-1623), French poet, born at Clairac, near Agen; went to Paris, where he attached himself to the Duc de Montmorency. His *Cabinet Satirique* forced him, as a Huguenot, to flee (1619) from Paris. Becoming a Roman Catholic, he wrote *Parnasse Satirique* (1623), a collection of poems of the same character as the *Cabinet Satirique*, and for which he was arrested, tried, and sentenced to death; but the sentence was commuted to banishment (1623). He wrote also *Pyrame et Thisbé*, a tragedy; and *Histoire Comique* (1621). The best edition of his *Œuvres Complètes* appeared in 2 vols. (1856).

Viaud, LOUIS. See LOTI, PIERRE.

Vibert, JEAN GEORGES (1840-1903), French genre painter and dramatist, born in Paris; painted *L'Appel après le Pillage*, *La Tentation*, *Le Barbier Ambulant*, *Un Courent sous les Armes*, *Le Départ des Mariés*, and *Le Premier-né*. He also executed *L'Apothéose de Thiers* for the Luxembourg, the *Bailli de Suffren* for the ministry of marine, the *Présentation* and the *Assumption* for the Chapel of the Virgin, and the *Annunciation* and *Mater*

Dolorosa for the chapel of the law courts. As a dramatist he is known by his *Tribune Mécanique*, *Les Chapeaux*, *Les Portraits*, and *Le Verglas*.

Viborg. (1.) Town and fortress, Finland, Russia, capital of Viborg gov., 72 m. N.W. of St. Petersburg, at the mouth of the Saima Canal (37 m.), which connects Lake Saima with the sea. It is an archiepiscopal see, with a cathedral (Russian Orthodox), an ancient Protestant church, a Swedish castle (1293), Russian, Swedish, and Finnish colleges, schools of navigation and commerce, and naval port. It manufactures machinery and soap, and has locksmiths' shops. There is an export trade in timber, iron, paper pulp, tar, tallow, fish, and butter, to the value of £100,000, and an import trade of £800,000. Pop. (1910) 48,730, excluding the Russian garrison. The gov. had an area of 16,620 sq. m., and a pop. of 422,000, until August 1911, when two communes of the Viborg gov. were incorporated in the Russian gov. of St. Petersburg. This action aroused great resentment in Finland. (2.) Town, Jutland, Denmark, 37 m. N.W. of Aarhus. The cathedral dates from 1130-69. Another fine edifice is the Black Friars (13th century). The industries include iron foundries, cloth factories, and distilleries. In heathen times Viborg was the religious centre of N. Jutland, and the coronation city of the Jutland kings. Pop. (1911) 10,885.

Vibrio, a name sometimes given to forms of bacteria in which the cell is spirally twisted. (See BACTERIOLOGY.) The name is also occasionally applied to some of the small nematodes.

Viburnum, a genus of hardy shrubs belonging to the order Caprifoliaceæ. They bear cymes or panicles of white or pink flowers, and many species are cultivated in British gardens.

V. opulus is the well-known dog rowan tree or guelder rose. To this genus belong *V. lantanoides*, the American wayfaring tree, and *V. prunifolium*, the American black haw.

Vicar and Vicarage. When the rector of a parish is a layman, or a spiritual corporation, such as the dean and chapter of a cathedral, the incumbent of the parish church is generally a vicar, and his house a vicarage; but in some cases he is a perpetual curate. By an act of 1868 all incumbents, not being rectors, are entitled to the style of vicar, if they are authorized to publish banns in the church, and solemnize marriages, churchings, and baptisms, and to receive the fees for doing so.

Vice-Admiral's Courts may be established in any British possession by commission under the great seal. They have jurisdiction under the Merchant Shipping Act, 1894, and also with regard to piracy, the slave-trade, foreign enlistment, and prizes. They now also possess in the colonies, with certain exceptions, the jurisdiction of the Admiralty Division of the High Court in England. Appeals lie to the Privy Council.

Vice-Chancellor. The first vice-chancellor was appointed in 1813, to assist the lord chancellor and the master of the rolls in the courts of equity. Their appointment has been discontinued since 1873, and their place is taken by the judges of the Chancery Division. The last to retire was Sir James Bacon, in 1886.

Vice-Consul. See CONSUL, MERCANTILE.

Vicente, GIL (c. 1470-c. 1536), Portuguese dramatist, born probably in Lisbon. His first drama (a pastoral) was produced in 1502, and he subsequently wrote seventeen pieces in Portuguese, ten in Spanish, and fifteen in a mixture of the two languages. These in-

clude sacred pieces, comedies and farces, many reaching a high level of excellence. The first collected edition appeared in 1532; later ed. (1834) by Feio and Monteiro. See *Lives*, in Portuguese, by Braga (1898), Ouguella (1890), Sanches de Baena (1894), and Brito Rebello (1902).

Vicenza, tn., cap. of prov. of same name, Venetia, Italy, on the Bacchiglione, 40 m. by rail w.n.w. of Venice; has manufactures of silk, woollen and cotton goods, bricks, and pottery. Its Gothic cathedral dates from the 13th century. Palladio, the architect, was a native. Pop. 45,000. In the N. of the province, near the Austrian border, is the district of Sette Comuni, or the seven communes of Asiago, Enego, Foza, Gallio, Lusia, Roana, and Rotzo. The inhabitants speak a German dialect. See Mary Agnelli's *Vicenza* (1909). The prov. has an area of 1,055 sq. m., and a pop. (est. 1910) of 450,000.

Vicenza, DUKE OF. See CAULAINCOURT.

Vice-President, the next in rank to a president. See PRESIDENT.

Viceroy, a title applied to an officer representing the supreme authority in a dependency, such as the lord-lieutenant of Ireland, and (since 1858) the governor-general of India. The title was also officially given to the governors of certain dependencies of the old Spanish monarchy, such as Naples, Peru, and Mexico.

Vich (Lat. *Ausa*), tn., Barcelona prov., Spain, 38 m. N. of Barcelona; has manufactures of sausages, hats, paper, and cotton goods. Its cathedral, rebuilt in 1893, occupies the site of an 11th-century basilica. Pop. 12,000.

Vichy-les-Bains (Lat. *Aqua Calida*), tn. and wat.-pl., dep. Allier, France, on the Allier, 32 m. s. of Moulins; has been known since Roman times for its mineral

springs. Bottled Vichy water is largely exported. Pop. 15,300.

Vicia, a genus of herbaceous plants belonging to the order Leguminosæ. They bear usually bluish or yellowish flowers, followed by two-valved pods. Several species are natives of Britain, notably the common vetch (*V. sativa*), the bitter vetch (*V. orobus*), the wood vetch (*V. sylvatica*), and the common tare (*V. hirsuta*).

Vicious or **Vituous Intromission**. See INTROMISSION.

Vickerstown, NORTH AND SOUTH, tn., Walney Island, N. Lancashire, England, inhabited chiefly by the employees of the Vickers Maxim firm. Pop. about 4,000.

Vicksburg, city, Mississippi, U.S.A., co. seat of Warren co., on the Mississippi; with cotton mills, foundries, and railway workshops. It is in one of the richest cotton-producing sections of the U.S.A. The place was captured by General Grant, July 4, 1863. Pop. (1910) 20,814.

Vico, GIAMBATTISTA (1668-1744), Italian philosophical and historical writer, born at Naples. In 1697 he became professor of rhetoric, and in 1734 historiographer to the king of Naples. All his books lead up to the *Principi della Scienza Nuova d'Intorno alla Commune Natura delle Nazioni* (1725; better ed. 1743). By this work Vico became the founder of the philosophy of history. His *Opera* were edited by Ferrari, with the author's autobiography (6 vols. 1836-7). See monographs by Flint (1885), Cosentini (1895), and De Nicola (1909).

Vico del Gargano, tn., Italy, in Apulia, prov. of and 38 m. N.E. of Foggia. Pop. 9,000.

Vico Equense, tn. Italy, on headland in Bay of Naples, 15 m. S.E. of Naples. Pop. tn. 3,000; comm. 11,000.

Victor, city, Teller co., Colorado, U.S.A., 4 m. S.E. of Cripple Creek, totally devoted to gold-mining. It was entirely destroyed by fire in 1899, but was rebuilt soon afterwards. Pop. (1910) 3,162.

Victor, CLAUDE PERRIN (1764-1841), duke of Belluno and marshal of France, was born in the Vosges, and entered the French army as a drummer boy in 1782, rising to be a general of division in 1797. He became governor of Batavia, ambassador to Copenhagen, marshal of France for his gallantry at Friedland (1807), and ambassador at Berlin. In 1808, in the Peninsular war, he beat the Spaniards; but in 1809 he found his superior in Wellington at Talavera. He then played an able part in the Russian campaign of 1812. In 1814 he quarrelled with Napoleon, and went over to the Bourbons, becoming minister of war (1821-3). See *Extraits des Mémoires Inédits de C. V. Perrin* (1846).

Victor, SEXTUS AURELIUS (fl. 370 A.D.), Roman historian, attracted the notice of the emperor Julian, who made him governor of a division of Pannonia. Theodosius gave him the office of city prefect, and in 373 A.D. he was the colleague of Valentinian in the consulship. He wrote *Casares*, short biographies of the emperors from Augustus to Constantius. It was edited by Schröter (1829-31). Other works reputed to be his are the *Epitome, Origo Gentis Romanæ*, and *De Viris Illustribus*; but they were certainly not written by this Aurelius Victor.

Victor Amadeus. See SAVOY.

Victor Emmanuel I. (1759-1824), king of Sardinia (from 1802). At first the French were in occupation of his continental dominions; but after the fall of Napoleon in 1814, he returned to Turin, and inaugurated a reac-

tionary régime. This produced a revolution in 1821, and Victor Emmanuel abdicated in favour of his brother, Charles Albert.

Victor Emmanuel II. (1820-78), king of Italy from 1849, ascended the throne after the defeat of the Piedmontese army by the Austrians at Novara. Aided by Garibaldi in Naples, Victor Emmanuel by the end of 1860 had created a new Italian kingdom. In 1865 he received Venice, though he was unable to secure that portion of Tyrol which he claimed. In 1871 he occupied Rome, and Italian unity was thus completed. See *Lives* by Godkin and Dicey.

Victor Emmanuel III. (1869), king of Italy, is the only son of Humbert I., and succeeded to the throne on the assassination of his father, July 29, 1900. He entered the army in 1887; was made lieutenant-general in 1894, and commanding-general at Naples in 1897. King Victor Emmanuel has given much attention to military studies, and has made frequent visits to the German army. He represented his father at the Russian court (1896), at St. James's (1897), and at the German court (1900). He married a daughter of King Nikolaus of Montenegro.

Victoria, a state of the Australian Commonwealth, lies in the S.E. of the continent, between 34° and 39° S. lat., and 141° and 156° E. long. It is separated on N. and N.E. from the state of New South Wales by the river Murray, and by an imaginary line running from Cape Howe to Forest Hill; on the W. lies South Australia, and on the S. and S.E. the Southern Ocean, Bass Strait, and the Pacific Ocean. Its area is 87,884 sq. m., or rather less than that of Great Britain. Pop. (1911) 1,315,000. The coast-line is broken by several bays and capes. The principal harbour is Port Phillip Bay (31 m. long and 20

m. wide at the middle); its headwaters are called Hobson's Bay, and form the port of Melbourne; its s.w. corner forms Corio Bay, at the head of which is situated Geelong. Victoria is traversed from E. to W. by the Dividing Range, from 60 to 70 m. from the s. coast. The streams which rise on the N. side (e.g. the Goulburn) flow towards the Murray, and those on the s. to the sea. The temperature to the N. of this range is higher than to the s., and the rainfall less: highest temperature, $111^{\circ}2' F.$; minimum, 27° ; average yearly rainfall, 25.51 in. In no part of Victoria are there the scorching heat and the liability to droughts which exist in some portions of the Australian continent. The only drawback to the climate is the hot 'wind,' which blows on an average for eleven days in the year. The climate is extremely salubrious, and the death-rate in 1909 was 11.24 per 1,000. The soil is generally good, and in many districts extremely rich, and all the corn, trees, fruits, and vegetables which are found in temperate Europe can be grown.

Victoria contains many salt and fresh water lakes and lagoons, most of them merely swamps during dry seasons. Lake Corangamite, the largest inland lake, covers 90 sq. m., and is quite salt.

The eastern part of the Dividing Range is called the Australian Alps, and divides the Gippsland district from the Murray; the western part is termed the Grampians and Pyrenees. The higher peaks of the Dividing Range are covered with snow for several months in the year. The lower mountains are for the most part densely wooded. The highest mountain in Victoria is Bogong, 6,503 ft. above sea-level.

The trees indigenous to the state belong to the eucalyptus family, popularly known as the

gum-tree. The red and blue gums are the most useful. Ferns are numerous, and the fern-trees grow to a large size. Wheat, oats, and barley are the principal crops; maize and rye are occasionally grown. Pease, beans, and potatoes, beets and sorghum, all thrive, and tobacco has been successfully introduced. Fibre plants such as ramie and New Zealand flax grow well. Fruits of all kinds give satisfactory results. Viticulture is carried on extensively, there being 23,000 acres of vineyards. Colonial raisins and currants and other dried fruits are supplanting the imported article. Large sums of money have been spent upon irrigation, and one settlement for 'intensive culture' has been established at Mildura on the Murray.

The principal industries are mining and pastoral and agricultural pursuits, but a large section of the population is employed in manufacturing. The grazing of sheep and cattle is carried on on a grand scale. The principal crops grown are wheat, oats, potatoes, hay, and wine. Large quantities of wool, butter, and frozen meat are exported. The total yield of the gold fields from 1851 to 1909 inclusive was 71,379,900 ounces, valued at £285,100,400; the yield in 1909 was 702,221 ounces, valued at £2,778,955. Coal is found in several localities, and in 1909 128,673 tons were raised. Considerable quantities of tin, quicksilver, silver, copper, lead, antimony, lignite, and kaolin have also been raised at various times. The manufactures include flour mills, breweries, distilleries, woollen mills, brickyards, soap and candle works, tobacco and cigar factories, tanneries, fellmongeries, saw-mills, and iron foundries. There are also bacon-curing, butter-making, clothing

and tailoring, bootmaking, printing, chemical, wool-washing, agricultural implement, cabinet-making, and upholstery establishments.

The principal ports of Victoria are Melbourne and Geelong in Port Phillip Bay; Portland, Belfast, and Warrnambool in the Southern Ocean; Port Albert, near Corner Inlet; and Cunningham, at the entrance to the Gippsland Lakes. The imports for 1909 were valued at £28,150,198, and the exports at £29,896,275, the principal items being wool, butter, gold, grain, sheepskins, frozen meat and rabbits, tallow, leather, live stock, cheese, bark, preserved meat, hay, chaff, and straw. The railways of Victoria belong to the state, the mileage in 1910 being 3,500. There is a branch of the Royal Mint at Melbourne, but it coins only gold. Up to December 31, 1909, the total coinage amounted to £129,182,621.

The state is administered by a governor (appointed by the crown for six years), a cabinet of eleven ministers, a representative council of thirty-four members (since 1906), and a legislative assembly of sixty-five members. The Adult Suffrage Act of 1908 conferred the franchise on women. Primary education is free, secular, and compulsory. Melbourne University (founded 1853) is both a teaching and an examining institution. The number of graduates in 1909 was 199, and of students 1,121, and women have the same corporate privileges as men. Three colleges — Anglican, Presbyterian, and Wesleyan — and the Ballarat School of Mines are affiliated to the university. A conservatorium of music is attached to the university.

Victoria was the first portion of Australia to be visited by Captain Cook, on April 19, 1770. In 1793 Dr. Bass sailed along its

southern coast, and demonstrated that the strait which bears his name separated the mainland of Australia from Tasmania. In 1801 Lieutenant Murray discovered Port Phillip Bay. In 1803 Colonel David Collins formed a convict settlement on the shores of Port Phillip, but it was abandoned three months afterwards. In 1850 Port Phillip was separated from New South Wales, and made a separate colony under the name of Victoria. Melbourne had been created a city in 1847. Gold was discovered in 1851, and from that date the colony advanced by leaps and bounds. Victoria dispatched several contingents to South Africa to assist in the war against the Boers, and sent a naval contingent to serve with the British troops in China. The immigration of coloured races is restricted as much as possible. See M'Lean's *Victorian Year Book*, Brain's *The Colony of Victoria* (1897), Labillardière's *Early History of the Colony of Victoria* (1878), Smith's *Cyclopædia of Victoria* (1903), H. G. Turner's *History of the Colony of Victoria* (2 vols. 1904), and J. W. Gregory's *Geography of Victoria* (1907).

Victoria. (1.) City, cap. of British Columbia, on the S.E. extremity of Vancouver I.; was incorporated in 1862. Esquimalt, a fortified naval station, and Oak Bay are suburbs. Victoria has rail connection with Ladysmith and Nanaimo, important coal-mining centres; also with Sydney, an agricultural centre. Railway ferries connect with the Canadian Pacific and the Great Northern Railways. There are extensive saw-mills, shipbuilding plants, iron-working plants, fish canneries, cement, and chemical and other factories; and the city is a tourist resort. Its leading architectural features are the Parliament buildings, Government House, the Canadian Pacific Hotel, Post

Office, and churches. Victoria has one of the best harbours on the Pacific coast, and is a port of call for the Transpacific steamship lines running to Vancouver, Seattle, and Tacoma. The climate is mild, and the rainfall small. There is a Canadian garrison in the city. Pop. 48,000. (2.) Capital, Hong-kong. See HONG-KONG. (3.) Capital and chief tn. of the British isl. of Labuan, Borneo, on the s. coast. Pop. 1,500. (4.) Town, Southern Rhodesia, 150 m. E. of Bulawayo. In the vicinity gold, silver, asbestos, lead, iron, and copper occur. Some 17 m. to the E. are the famous ruins of Great Zimbabwe. Pop. 500. (5.) Seaport tn., Brazil, cap. of Espírito Santo, 290 m. N.E. of Rio de Janeiro. Sugar, rice, coffee, and manioc, produced in the surrounding district, are exports. The harbour is fortified. Pop. about 10,000. (6.) Pueblo of Luzon I., Philippines, 6 m. N.E. of Tarlac. Pop. 15,000. (7.) Town, Venezuela, 32 m. S.W. of Caracas. Its trade is in coffee, sugar, cacao, and cereals. Pop. about 8,000. (8.) Town, Chile, in Malleco prov., 120 m. S.S.E. of La Concepcion. Pop. 8,000.

Victoria, a genus of tropical American aquatic plants belonging to the order Nymphaeaceae. There is but one species, the beautiful Queen Victoria water lily, water platter, or royal water lily (*V. regia*). This remarkable plant bears oval or orbicular leaves, often six feet in diameter. The flowers are very large, the sepals being brownish in colour, whilst the outer petals are white and spreading, and the inner petals are rose-coloured and filamentous. The flowers are followed by large, green, prickly, fleshy berries, containing numerous dark-coloured seeds.

Victoria, a British ironclad, launched in 1887; whilst temporary flagship in the Medi-

terranean, was, on June 22, 1893, inadvertently rammed by the *Camperdown*, off the coast of Syria, and sank within a few minutes, carrying down with her Vice-Admiral Sir George Tryon and 358 of the crew.

Victoria (1819-1901), queen of Great Britain, ascended the throne in 1837, in succession to her uncle William IV. She was the daughter of the Duke of Kent, son of George III. Her reign falls into two divisions—(1) the period from 1837 to 1865, the death of Lord Palmerston; and (2) from 1865 to 1901. From 1837 to 1865 the middle classes, who had gained so much from the Reform Bill of 1832, were in power, and during the greater part of the period the Whigs were in office. Lord Melbourne was prime minister at the time of the Queen's accession. Canada was in a state of revolt, and in 1838 Lord Durham was sent out to settle matters, and Upper and Lower Canada were united under a popular constitution. At home the discontent of the lower orders had resulted in the Chartist movement, and riots broke out in various parts of England and Wales. In 1839 Melbourne's ministry fell; but as the queen and Peel (the leader of the Tories) could not agree over the bedchamber custom, Melbourne returned to power. On Feb. 10, 1840, the Queen married her cousin Albert, youngest son of the Duke of Saxe-Coburg. The adoption of the penny postage, the establishment of an education department, and the Irish Municipal Bill were measures of importance.

Peel's ministry, which lasted from 1841 to 1846, saw a war with Afghanistan (1841-2), and the beginning of a long war with the Sikhs (1845-9), with the result that the Punjab was in 1849 annexed to British India. The Tractarian movement stirred up

some excitement, which was increased when in 1815 Newman seceded to Rome. In Scotland some five hundred ministers in 1843 left the Established Church and founded the Free Church of Scotland. Peel imposed an income tax, renewed the Bank Charter Act, and in 1845 realized the importance of allowing foreign corn to enter the country free of duty. A famine in Ireland finally decided Peel to open the ports. The Anti-Corn Law League under Cobden and Bright supported him, and after resigning in December 1845, Peel returned to office in 1846, and carried the repeal of the Corn Laws. His Tory protectionist opponents then united with the Whigs and Radicals and overthrew the government. The Conservative party was broken up, and the Whigs were triumphant.

The friendly relations with Louis Philippe, which had continued for some years, were much valued by the queen, who resented the rough though successful methods which Palmerston adopted with regard to France. With the fall of Peel and the accession to office of Lord John Russell's ministry, the queen was again brought into close relations with Palmerston as foreign secretary. When revolutions burst out all over Europe in 1848, Palmerston sympathized with them, while the queen and Prince Albert naturally disliked any form of intervention on the part of England in favour of revolution. The exhibition of 1851 was a sign of England's peaceful policy. In 1850 the queen and Prince Albert objected to Palmerston's habit of sending to European courts dispatches on foreign affairs before they had been subjected to the royal consideration. In December 1851 Palmerston resigned. In 1855 Palmerston, whose hold

on the nation had vastly increased, became prime minister, and in 1856, by the treaty of Paris, brought the Crimean war to a successful conclusion. In 1857 he concluded a war with Persia, and entered upon a war with China over the question of the seizure of a British vessel. After the general election in 1857 he again became prime minister. During the Indian mutiny, which broke out in 1857, the conduct of the ministry was often criticised by the queen. In 1858, after Orsini's attempt to kill Napoleon III., Palmerston was defeated on the Conspiracy Bill. After the short ministry of Lord Derby, he again became prime minister in June 1859, and remained at the head of affairs till his death in 1865. The outbreak of civil war in America in 1861, and the Lancashire cotton famine which followed, were handled by the ministry on the whole with success, though the sailing of the *Alabama* from the Mersey proved later an expensive matter for Britain.

In December 1841 the Prince Consort died, and his death, coupled with that of Lord Palmerston in 1865, marked a new epoch in the queen's life. The latent Conservatism of the lower middle classes was appreciated by Disraeli, who in 1838 became prime minister. Two months later Gladstone carried a resolution in favour of the disestablishment of the Irish Church, and Disraeli's ministry fell. Gladstone's first ministry lasted from November 1868 till January 1874. It saw the Franco-German war; it disestablished the Irish Church; it brought forward an Irish Land Act and an elementary education act; it abolished religious tests at the universities of Oxford and Cambridge. Moreover, in 1871, Cardwell abolished purchase in the army; while, in 1872 and 1873, the Ballot Act and the Judicature

Act were measures of undoubted usefulness. In all these measures the queen took a close interest. She disliked the disestablishment of the Irish Church, and she long hesitated before signing the royal warrant abolishing army purchase. In 1874 a strong Conservative majority was returned, and Disraeli again became prime minister, and remained in office till 1880. In 1876 the queen assumed the title of Empress of India, and Disraeli became Earl of Beaconsfield. With singular foresight Disraeli had, in 1875, purchased about one-half of the shares of the Suez Canal. Lords Beaconsfield and Salisbury were supported by the nation when they went to the congress at Berlin in June 1878. Russia was forced to abate her demands, and the British ministers returned bringing 'peace with honour.' Britain was involved in a war with the Zulus, and it was not till July 1879 that the conquest of Zululand was effected. In that year Gladstone attacked the government in his Midlothian campaign, and in 1880 a large Liberal majority was returned. Gladstone at once formed a ministry, which remained in power till 1885. The British defeat at Majuba Hill on Feb. 23, 1881, was followed by a convention, giving the Boers self-government under British suzerainty. A rising in Egypt under Arabi Pasha necessitated immediate measures. As France refused to take any action, a British fleet bombarded Alexandria, and a British army won the battle of Tell-el-Kebir on Sept. 13, 1882, and restored the Khedive. Henceforward Britain was supreme in Egypt. In January 1885 General Gordon, who went to Khartum to withdraw all the Egyptian garrisons, was killed. The Irish Land League was formed in 1879, and an agitation for Home Rule be-

gun. A land act was passed in 1881; but disorder increased, and in 1882 Lord Frederick Cavendish, the chief secretary for Ireland, and Mr. Burke, the under-secretary, were murdered in Phoenix Park, Dublin. A cranes act was at once passed, and for a time order was restored to Ireland. In 1884 a Franchise Bill became law, and in June 1885 Gladstone resigned. Lord Salisbury's administration only lasted till November 1885, when a general election took place, and Gladstone's third premiership began. A Home Rule Bill for Ireland was thrown out by the House of Lords; a split took place in the Liberal party, the opponents to Gladstone's bill being styled Liberal Unionists, and Lord Salisbury formed his second administration in July 1886, and continued in office till 1892. Steps were taken to preserve order in Ireland; county councils were created in 1888; and in 1891 free education was granted. In 1887 the queen celebrated her jubilee. In 1892 Gladstone again became prime minister; but having failed to carry his second Home Rule Bill, he retired in 1894, leaving Lord Rosebery at the head of the government. The latter failed to carry a bill for the disestablishment of the church in Wales, and his ministry fell in June 1895. Lord Salisbury's third administration followed. The close of 1895 saw the Venezuelan dispute with America, and the Jameson Raid into the Transvaal, which ended disastrously in January 1896. The following year saw the beginning of the British advance in the Sudan, and the queen's diamond jubilee (1897). The attempt of France to hold Fashoda almost led to war in 1898. In 1899 war broke out between Great Britain and the Transvaal republic, which was aided by the Orange Free State.

But in June 1902 the Boers were vanquished and peace made. In 1900 the Australian Commonwealth Bill was passed, and the same year the Boxer rising in China and massacres at Peking led to a joint invasion of China by Great Britain, Russia, France, and Japan. At the general election (1900) the Conservatives were again in a majority, and Lord Salisbury continued in office.

Queen Victoria showed herself strictly impartial in the party politics of her reign, but she clearly recognized that the crown was the central tie which held together her vast empire. Her wisdom, her knowledge of foreign politics, her unselfishness and uprightness were all remarkable traits of her long reign. No sovereign has ever been more revered by her subjects. See Lee's *Queen Victoria: a Biography* (1904), *The Letters of Queen Victoria*, ed. by A. C. Benson and Viscount Esher (1907), *Queen Victoria's Journals*, extracts, ed. by Viscount Esher (1909), and Martin's *Queen Victoria as I knew her* (1908).

Victoria, LAKE, SARY-KUL, or **ZOR-KUL**, on Pamir highland, in 37° 27' N. lat., 13,870 ft. above sea-level, 17 m. long and 3 m. broad, is traditionally considered as the principal source of the Oxus. Since 1885 it has marked a section of the Pamir frontier between Russia and Afghanistan.

Victoria, MOUNT, the loftiest summit of Papua, British New Guinea, in the s.e. of the Owen Stanley range. Alt. 13,120 ft.

Victoria and Albert, ORDER OF. See **ORDERS OF KNIGHTHOOD**.

Victoria Cave, a cavern, W. Riding, Yorkshire, England, 2 m. N. of Settle, in the face of the limestone cliff, about 1,450 ft. above the sea. Large deposits of bones of the elephant, bear, hyena, and rhinoceros, and bronze and bone implements, coins, and

pottery have been found in this cave, which was discovered in 1837.

Victoria Cross, a decoration conferred on officers and men of all ranks of the British army and navy for personal bravery. It was founded on Jan. 29, 1856, and consists of a bronze Maltese cross, bearing in the centre the royal crown, surmounted by a lion, while on a scroll underneath is the inscription, 'For Valour.' A special pension of £10 a year is granted to every soldier who receives the Victoria Cross, with an additional £5 for each bar. In the event of an annuitant being unable to earn a livelihood, the amount may be increased to £50. The distinction has been gained by 522 officers and men, of whom 179 are now (1910) living. In 1911 the right to receive the V.C. was extended to native soldiers in the Indian army. See Toomey's *Heroes of the Victoria Cross* (1887).

Victoria Day. See **EMPIRE DAY**.

Victoria Eugenie Julia Ena (1887), queen of Spain, was born at Balmoral, Scotland, and is a daughter of H.R.H. Princess Henry of Battenberg, the youngest sister of Edward VII. She married King Alphonso XIII. of Spain on May 31, 1906.

Victoria Falls, THE, on the Zambezi, Northern Rhodesia, were discovered by Livingstone in 1855. They are 280 m. W.N.W. of Bulawayo by rail, and 1,642 m. N.N.E. of Cape Town by rail. At this point the Zambezi rushes over a chasm about 400 ft. deep and through a huge zigzag cleft in intrusive basalt rock. The river above the falls is a mile broad, but the lip of the chasm is broken by several islands, densely covered with trees. Great columns of vapour of smoke-like appearance rise from the falls, and are visible for some 20 miles. Below the falls, the Zambezi

surges southwards for 130 yds. through a narrow channel into the Boiling Pot, then abruptly turns west and enters a second chasm, the 'Grand Cañon,' nearly parallel with the first. Over this the Cape to Cairo railway is carried by a bridge, just 700 yds. below the cataract, spray from which falls on it. The course of the river below the falls is known as the Batoka Gorge. The height of the falls is nearly twice that of Niagara, and the volume of water is greatest in April, when the level in the gorge is about 50 ft. higher than in November. The horse-power of the Victoria Falls is estimated at from 300,000 to 600,000, according to rainfall, and it has been proposed to tap some of this and to transmit electrical energy thence to the Rand mines.

Victoria Land, or **SOUTH VICTORIA LAND**, the name given to that part of the supposed Antarctic continent s. of New Zealand, having Ross Sea to the w. Here are the volcanoes Erebus and Terror, discovered by Ross in 1841.

Victoria League, **THE**, an institution founded at the Diamond Jubilee to unite the different sections of the empire by non-political bonds. Its chief activities are the entertainment of visitors from the over-sea dominions, the provision of books and magazines for settlers in remote districts, the oversight of imperial teaching in the schools at home and abroad, and the exchange of information and advice between similar classes of colonists and home-dwellers. The league possesses a large number of local heads both in Britain and the colonies. Its president is the Countess of Jersey, and representatives of all political parties sit on its committee. Its head office is at Millbank House, Westminster, S.W.

Victorian Order, **THE ROYAL**. See **ORDERS OF KNIGHTHOOD**.

Victoria Nyanza, a lake in equatorial Africa, cut politically by 1° s., the part to the N. of this line being included in the British protectorate of Uganda, and the part to the s. of it in German E. Africa. The area is estimated at 26,000 sq. m. On the N.E. it projects into Kavirondo Bay. Farther w. the north coast describes successively Berkeley Bay, with Port Victoria, on its E. shore; Macdonald Bay; Napoleon Gulf, which at its entrance is blocked by the island of Buvuma. The only outlet of the lake is through this gulf, by the Victoria or Somerset Nile. Farther w. is Murchison Bay, hemmed in on the w. by a three-fingered projection, on which stands Entebbe or Port Alice. The N.W. corner of the lake is occupied by the Sesse Archipelago, including the large island of Bukasa. The southern end of the lake projects eastwards into Speke Gulf, and southwards into Emin Pasha Gulf. To the N. of the mouth of Speke Gulf lies the island of Ukereve, 25 m. long by 12 broad. The greatest feeder of the lake is the Kagera on the w. The total catchment area of the lake is estimated at from 95,000 to 100,000 sq. m. The lake is connected by railway from Port Florence with Mombasa on the Indian Ocean. Discovered by Speke in 1858, the lake was circumnavigated by Stanley in 1875 and 1889, and by Baumann in 1892. A survey by Commander Whitehouse of the whole coast and islands of the lake was completed in 1903.

Victoria University, **THE**, Manchester, was founded in 1880. Its nucleus was Owens College, which dates from 1846, when John Owens left about £100,000 to found a college free from religious tests. Until 1903 the university was made up of Owens

College, Manchester, University College, Liverpool, and Yorkshire College, Leeds; but in that year the University College, Liverpool, became a separate university, the old Owens College became the only college of a distinct University of Manchester (see MANCHESTER), and in 1904 a charter was granted for the establishment of a University of Leeds.

Victoria West, tn., in district of same name, Cape of Good Hope, 428 m. by rail E.N.E. of Cape Town. The town stands 4,160 ft. above sea-level. Pop. tn. 3,000; dist. 7,500.

Victory, a British 100-gun ship (2,164), launched in 1765; was Nelson's flagship at Trafalgar (1805), and now (1912) serves as flagship at Portsmouth.

Vicualling. See RATONS.

Vicualling Bill, a custom-house permit, authorizing the embarkation of bonded stores by the skipper of any outward-bound ship, as supplies for his voyage.

Vicualling Yards. The vicualling yards of the British navy are: At Home—Deptford, Gosport, Plymouth, Haulbowline (Queenstown). Mediterranean—Gibraltar, Malta. West Indies—Bermuda. Africa—Cape of Good Hope. China—Hong-kong and Wei-hai-Wei. Australia—Sydney.

Vicuña, or VICUNIA (*Auchenia vicunia*), one of the two wild forms of the genus *Auchenia*, the other being the guanaco. It is smaller and more slightly built than the guanaco, is of a pale brown colour, and has no callosities on the hind legs. It is found in the Cordillera, in flocks of a male and from six to fifteen females. Vicuñas are hunted by the Indians for their wool.

Vida, MARCO GIROLAMO (1490-1566), modern Latin poet, born at Cremona; became a canon of St. John Lateran in Rome, and

afterwards prior of St. Silvester, near Tivoli. Pope Clement VII. promoted him (1532) to be bishop of Alba. His chief poems are *Christias* (1535), *Scacchiae Ludus* (1527), and *De Arte Poetica* (1527). See *Life* by Lancetti (1840).

Vidal, PEIRE, troubadour, who flourished at the end of the 12th century and the beginning of the 13th. He was born at Toulouse, and obtained the patronage of Alfonso II. of Aragon, Alfonso VIII. of Castile, Count of Marseilles, and Boniface de Montferrat. His lyrics were published by Bartsch (1857). See *Life* by Schopf (1887).

Vidin. See WIDIN.

Vidocq, EUGENE FRANÇOIS (1775-1857), French detective, born at Arras. After a series of escapades, which resulted in a sentence of eight years' imprisonment, he was lodged in the galleys, but made his escape. In 1809 he was employed by the secret police of Paris. In 1832 he opened a bureau in Paris for the recovery of stolen goods, which was suppressed by the police. It is doubtful if the *Mémoires* (4 vols. 1828) attributed to him are from his pen.

Vieille, PAUL MARIE EUGÈNE (1854), French engineer, born in Paris; became sub-director of the government powder laboratory in Paris (1879) and professor of physics in L'Ecole Polytechnique (1885). In collaboration with Sarrau he worked on the subject of ballistics; he also invented (1885) smokeless powder.

Vieira, ANTONIO (1608-97), Portuguese missionary, born at Lisbon; became in Brazil a member of the Jesuit order (1625), and engaged in missions to the Indians. Finally (1681) he became director of the convents of the Jesuits. His works include *Historia do Futuro* (1718) and *Voz Sagrada, Politica, Rhetorica, e Metrica* (1748).

Vienna (Ger. *Wien*), the capital of the Austrian empire, in the prov. of Lower Austria, stands on the Danube, where the river leaves the Bavarian plateau and enters the Austro-Hungarian plain. It commands the March or Morava valley, which gives access to Germany, and it is the nearest point on the Danube to the head of the Adriatic, with which Vienna is connected at Trieste by a railway passing through the Semmering tunnel. Vienna may be regarded as the centre of five natural districts: The E. Alps, abounding in salt, timber, and iron; Bohemia, rich in coal and silver; Moravia, fertile in itself; Upper Hungary, with its precious metals and copper; and the Hungarian plain (the *puszta*), a region of high agricultural and pastoral abundance, engirt with vine-clothed slopes. It is also a great manufacturing centre. Its specialities are iron and steel goods, silks, cheap furniture ('bent-wood'), ornamental leather and bronze work. The kernel of the city, the Innere Stadt, is encircled by the Ringstrasse, with its palaces, and by the Franz-Josefs Quay, on the Danube Canal, which is a branch of the Danube. Outside the kernel lie numerous suburbs, the total area being 72 sq. m., with a population of 2,030,850 in 1911, spread over twenty-one districts or official *Bezirke*. In the Innere Stadt are the cathedral of St. Stephen (1300-1510), with a tower 450 ft. in height, and the Imperial Palace or Hofburg, with a library of about 1,000,000 volumes, and its wonderful relics, such as Charlemagne's coronation regalia and Charles the Bold's famous diamond. On the Ringstrasse are situated many imposing public buildings—mostly modern, as nearly the whole of Vienna is—such as the Opera House

(seating 3,000 people); the university (1874-84, though founded in 1365), which contains one of the world's famous medical schools—in 1910-11 it had 539 teachers and 9,736 students; the Parliament House and Supreme Law Courts (in the former the imperial government sits alternately with Budapest); and the town hall. Vienna possesses many public parks, notably the Prater (7 sq. m.), and a magnificent picture gallery, supreme in its examples of the Venetian masters, and in those of Dürer and Rubens. The imperial and royal observatory of Vienna is situated in lat. 48° 13' 55" N. and long. 16° 20' 22" E., at the N.W. suburb of Währing. The mean temperature is about 30° F. in January and 69° F. in July. The annual rainfall is some 24 in. The Austro-Hungarian delegations meet alternately at Vienna and Budapest. Part of its water supply is derived from the Alps, about 42 m. to the S.W.

Here was the Roman frontier town of Vindobona (established in 14 A.D.). Mediæval Vienna was the capital of the Östmark (Eastern March), was a gathering and halting point for Crusaders, and in 1276 became the capital of the possessions of the Hapsburgs. Vienna endured famous Turkish sieges in 1529 and 1683, the latter being raised by John Sobieski, king of Poland. The city has been often chosen as a meeting-place for treaty-making powers. Vienna was the birthplace of Maria Theresa, Marie Antoinette, Maximilian of Mexico; of the musicians, Johann Strauss, Schubert, Czerny; of Marshal Daun; of the painter Schwind; of Grillparzer, the dramatist; and of the traveller and diplomat, Baron Hübnér. See Hickmann's *Wien im 19 Jahrhundert* (1903), and Bermann's *Alt und Neu Wien* (1903).

Vienne. (1.) Dep. of W. France, between Indre on E. and Deux-Sèvres on W.; covers an area of 2,711 sq. m., and is watered by the Vienne. Wheat, oats, and vines are cultivated, and cutlery, arms, and paper are manufactured. Pop. 335,000. The capital is Poitiers. (2.) (Lat. *Vienna*). Town, dep. Isère, France, on l. bk. of Rhone, 18 m. S. of Lyons; has manufactures of cloth, woollen caps and gloves, and paper, as well as lead and copper mining, and iron foundries. There are schools of weaving and design. Its cathedral is Romanesque Gothic. It was the chief city of the Allobroges, later of the kingdom of Burgundy (450-534 and 879 onwards). Under the Roman empire it rivalled Lugdunum (Lyons) in importance. Several remains of the ancient city still survive. Pop. 25,000.

Vienne, HAUTE. See HAUTE-VIENNE.

Vieques, ISLA DE, or CRAB ISLAND, 7 m. E. of Porto Rico, and under its administration, together with the neighbouring island of Culebra. It is 19 m. long and 3 m. broad. Sugar and cattle are the leading products. Pop. 10,000.

Vierge, DANIEL URRABIETA (1848-1904), Spanish artist, born at Madrid; went to Paris (1870), where he was employed as draughtsman on *Le Monde Illustré*, *La Vie Moderne*, and *L'Image*. He illustrated Hugo's *L'Année Terrible* (1874), *Les Travailleurs de la Mer* (1876), *L'Homme qui Rit* and *Quatre-vingt-treize* (1877), *Les Misérables* and *Notre Dame de Paris* (1882); Michelet's *Histoire de France* (1876-8), and *Histoire de la Révolution* (1883-7); Quevedo's *Don Pablo de Segoria* (1882); Bergerat's *L'Espaniole* (1891), *La Nonne Alfarcz* (1894), and *Le Cabaret des Trois Vertus* (1895); *Don Quixote*, and *El Gran Tacano*.

He was a brilliant master of black-and-white. See Marthold's *Daniel Vierge* (1905).

Viernheim, tn., Germany, in Hesse, 5 m. N.E. of Mannheim. Pop. (1910) 9,240.

Viersen, tn., Rhine Province, Prussia, 10 m. S.W. of Krefeld; has manufactures of velvet, silk, and plush goods, and damask. Pop. (1910) 30,172.

Vierzon, tn., dep. Cher, France, on the Cher, 20 m. by rail N.W. of Bourges; has manufactures of agricultural implements, glass, and porcelain. Pop. 12,000.

Vierzon Village, manufacturing comm., France, in Cher dep., adjoining Vierzon. Pop. 9,500.

Vieste, tn., Italy, in Apulia, prov. of and 45 m. N.E. of Foggia, on the Adriatic. Pop. 9,000.

Vieta, FRANCISCUS, or FRANÇOIS VIÈTE (1540-1603), French mathematician, was born at Fontenay-le-Comte. He was a lawyer at Poitiers until 1567; then councillor of the parlement of Brittany and of that of Tours (1589). His *Opera Mathematica* were published at Leyden (1646).

Vietri, comm., Italy, in Campania, prov. of and 2 m. W. by S. of Salerno. Pop. 8,500.

Vieux Condé, comm., France, in Nord dep., 7 m. N. by E. of Valenciennes; coal is mined in the vicinity. Pop. 7,700.

Vieuxtemps, HENRI (1820-81), Belgian violinist and musical composer, born at Verviers. He was a great exponent of the modern brilliant school of violin-playing, and many of his compositions take a high place in classic violin music. See *Life* by Kufferath (1883).

Vigan. (1.) Pueblo, Luzon I., Philippines, cap. of Ilocos Sur prov., 108 m. N. of Dagupan; has fisheries, brick kilns, cotton manufactures, and boat-building yards. Pop. 15,000. (2.) LE, invalid resort, dep. Gard, France, 29 m. N.W. of Montpellier; has silk-

spinning and glove-making. Coal is mined and lithographic stone quarried. Pop. 4,600.

Vigevano, walled tn., Pavia prov., Lombardy, Italy, on the Ticino, 19 m. S.W. of Milan; has a cathedral; also silk-spinning and manufactures of macaroni, boots, and furniture. Pop. (comm.) 24,000.

Vigfusson, GUDBRANDR (1828-89), Icelandic scholar, born in Breidafjörð; became stipendiary in the Armagnac library at Copenhagen. Settling in Oxford (1866), he was appointed Icelandic reader (1884). His writings opened a new era in the scholarship of his country; they include *Tímalat* (1855); *Biskopa Sögur* (1856-78); *Bardar Saga* (1860); and *Fornsögur*, with Möbius (1860); *Eyrbyggja Saga* (1864); *Flateyjarbók*, with Unger (1860-8). He completed the *Icelandic-English Dictionary* (1859-74), commenced by Cleasby; while *Sturlunga Saga* appeared in 1878, *Corpus Poeticum Boreale* (with York Powell) in 1883, and *Origines Islandicae*, also with Powell, in 1905.

Vigil, the evening before certain holy days—e.g. the Nativity. St. Jerome defends the custom of all-night vigils (*Ep.* xxxvi.); but about the year 420 evening fasts were substituted. A night-long fast on All-hallows-day seems to have continued in England till 1545.

Vigil, FRANCISCO DE PAULA GONZALEZ. See GONZALEZ VIGIL.

Vigilance Societies, self-constituted tribunals of citizens in the western states of N. America, formed to punish summarily horse-thieves, highway robbers, burglars, swindlers, murderers, and other criminals, after a rude form of trial; also, in some cases, for the suppression of vice and drunkenness. These societies have also been known as *Vigilantes*, *Regulators*, law and order

men, and White Caps. See LYNCH LAW.

Vigilantius, a presbyter of the 4th century, a native of Gaul, who put himself in opposition against the excessive cult of saints, the use of relics, and the ultra-ascetic tendency of the monks. See Gilly's *Vigilantius and his Times* (1844).

Vigna, PIER DELLA, or PETRUS DE VINEA (c. 1190-1249), Italian statesman and jurist, was born at Capua. He rose to be the chancellor of the Emperor Frederick II. He revised the laws of the two Sicilies, acted as legate to the papal and English courts, and defended Frederick before the Council of Lyons (1245). His enemies accused him of plotting against the emperor's life, and he was imprisoned and blinded. He wrote a treatise, *De Potestate Imperiali*, and Latin and Italian poems. His *Letters* (1566; later ed. by Iselin, 1740) are invaluable for the history of the time. See Huillard-Bréholles's *Vie et Correspondance de Pierre de la Vigne* (1864).

Vignette, a photograph or drawing in which the background is gradually shaded away to the margin. The word originally meant the Gothic ornament of vine leaves and grapes used in architecture; also the head and tail pieces employed by printers.

Vignola, whose real name was GIACOMO BAROZZI or BAROCCHI (1507-73), Italian architect, born at Vignola, near Modena; was papal architect (1550) and architect of St. Peter's, Rome (1564). He designed the church of St. Petronius at Bologna and some of the finest buildings in that city. He became architect to Pope Julius III., and built for him the Villa Giulia. He also designed the palace of Cardinal Alexander Farnese at Caparola, near Viterbo. He wrote a long famous *Regole delle Cinque Ordini*

d'Architettura (1563; new ed. 1815).

Vigny, ALFRED VICTOR, COMTE DE (1799-1863), French poet, born at Loches (Indre-et-Loire). In 1822 were published his *Poèmes*, followed (1824) by *Eloa* and (1826) *Poèmes Antiques et Modernes*. His novel of *Cinq Mars* (1826), which shows the influence of Sir Walter Scott, is the first historical romance of French literature. Then followed the drama *La Maréchale d'Ancre* (1831). *Stello* (1832) is a novel to the glorification of the luckless poets Chénier, Gilbert, and Chatterton. Next, in 1835, appeared *Servitude et Grandeur Militaires*. The same year he achieved his greatest triumph in his drama of *Chatterton*. In 1842 he was received into the Academy. In 1864 appeared *Les Destinées*, containing verse of rare beauty; and (1867) *Journal d'un Poète*, of uncommon range and delicacy of sensibility. His *Œuvres Complètes* appeared in 8 vols. (1883-85). See notices by M. Paléologue (1891), E. Montégut (1867), and Sainte-Beuve.

Vigo, city, prov. Pontevedra, Spain, naval station on Atlantic, and one of the best harbours in Spain; has considerable fishing and preserving industry. The harbour is being improved, and a new pier is expected to be completed in 1912. Exports (1910) £563,207 (of which £489,730 represented sardines); imports, £394,126. Pop. 26,000.

Vigo Bay, BATTLE OF. Here in 1702 the French Admiral Château-Renault was attacked and defeated by the English and Dutch under Sir G. Rooke and Admiral Van Almonde. See *Political History of England*, ix. (1909).

Vihara. See INDIAN ARCHITECTURE.

Vilayanagar, or BIJAYANAGAR. See BIJAYANAGAR.

Viking. See NORSEMEN.

Vikramaditya. See INDIA.

Vikramorvasi. See KĀLIDĀSA.

Vilayet, the name given to a Turkish province. A *sanjak* is a subdivision of a vilayet.

Vilhelmina, comm., Sweden, in Vesterbotten gov., 168 m. w.s.w. of Luleå. Pop. (1911) 7,368.

Villich, comm., Rhenish Prussia, immediately N.E. of Bonn. Pop. (1910) 15,593.

Vilkomir, or WILKOMIERZ, tn., Kovno gov., W. Russia, 40 m. N.E. of Kovno city. It has manufactures of pottery and mineral waters. Pop. 16,000.

Villacañas, comm., Spain, 45 m. S.E. of Toledo. Pop. 6,200.

Villacarillo, comm., Spain, prov. of and 45 m. N.E. of Jaén. Pop. 9,700.

Villach, tn., Austria, in Carinthia, 22 m. w. of Klagenfurt, on the Drave. It manufactures articles of wood and of lead, metallic colours, machinery, and paper, and was formerly a great entrepôt of the trade between Germany and Italy. Pop. (1911) 19,265.

Villa Concepcion. See CONCEPCION.

Villa del Pilar. See PILAR.

Villa do Conde, seapt., Portugal, 15 m. N. by w. of Oporto. Pop. 5,500.

Villa Encarnacion, tn., Paraguay, on the Paraná R., 190 m. S.E. of Asuncion. Pop. 12,000.

Villafranca. (1.) Town, Verona prov., Venetia, Italy, 10 m. S.W. of Verona; has manufactures of silk. Pop. 10,000. Here, in 1859, peace was concluded between France and Austria. (2.) Town, Italy, in Piedmont, 20 m. S.S.W. of Turin. Pop. (comm.) 7,000. (3.) Seaport, France, on the Mediterranean, 2 m. E. of Nice, a charming winter resort. Pop. (comm.) 5,000.

Villafranca de los Barros, tn., Spain, prov. of and 42 m.

s.e. of Badajoz. Pop. (comm.) 10,000.

Villafranca del Panades, tn., Spain, in Catalonia, prov. of and 25 m. w. of Barcelona. Pop. 8,000.

Villa Franca do Campo, tn., on s. ct. of São Miguel I., Azores; was overwhelmed by an eruption of mud in 1522, and in 1907 experienced severe shocks of earthquake. Pop. 7,500.

Villagarcia, port, Spain, in Galicia, in Pontevedra prov., 56 m. s.s.w. of Corunna. In 1910 its imports were valued at £108,363; and its exports (chiefly pit-props, onions, tin, and wolfram) at £70,162. Pop. 8,000.

Village Community. Seebohm believes that in eastern England the agricultural village community existed—and in western England the tribal system—in a pastoral stage, with a periodic redistribution of lands, which has no place in the village community so far as regards arable land. The questions naturally arise—Was the village community a primitive institution? Was it composed of freemen or of serfs? And if of freemen, when was the manorial system imposed on it? And, above all, what was the relation of the village community to the tribal system which existed side by side with it as in Britain? To these questions Vinogradoff returns answers which represent the safe middle ground. 'The communal organization of the peasantry he finds more ancient than the manorial order'—that is, it may have been an institution of free men, though probability points to a mixture of free and unfree elements. But it is hardly a primitive institution, because by its division of arable land into strips it shows traces of that periodical redistribution of the land which characterizes the tribal system. The village community is, therefore, what the tribal system became

when agriculture was introduced. Hence the village communities were the tribe divided into agricultural groups, with an overlord, generally at a distance, to whom tribute was paid. At first the relation between the village and the overlord was remote, but the feudal system introduced intermediate lords, who looked not so much for tribute as for the cultivation of the land; and thus the distant lord was replaced by a neighbouring lord of the manor, and the freedom of the village community was changed to the practical servitudes of the manor. This change may have come with the advent of the Romans, but feudalism made the pressure closer. See Seebohm's *English Village Communities* (1884), Gomme's *Village Community* (1890), Baden-Powell's *The Indian Village Community* (1895).

Villajoyosa, seapt., Spain, prov. of and 18 m. N.N.E. of Alicante. Pop. 9,000.

Villalba, tn., Spain, in Galicia, prov. of and 22 m. N. by w. of Lugo. Pop. 14,000.

Villa Lerdo, tn., Mexico, state of and 125 m. N.E. of Durango. Pop. 8,000.

Villamartin, comm., Spain, prov. of and 44 m. N.E. of Cadiz. Pop. 6,200.

Villa Mercedes, tn., Argentina, prov. of and 60 m. E.S.E. of San Luis. Pop. 5,500.

Villani, GIOVANNI (c. 1275-1348), Florentine historian, was prior of Florence in 1316, 1321, and 1328. His chronicle becomes of the utmost value as it approaches the author's own period. Scarcely less important is the continuation of the work by his brother Matteo, who brought it down to 1363. Finally Matteo's son Filippo not only completed his father's eleventh book, but himself undertook a useful *Liber de civitatibus Florentinarum famosius civibus* (ed. by Galletti, 1847). The earli-

est edition of the entire chronicle (1537) was followed by those of Magheri (1823-6; with Mazzuchelli's *Vite*), Gherardi-Dracmanni (1844), and Racheli (1857-88). See, too, Selfe and Wicksteed's *Selections from the first nine Books of the Cronache Fiorentine* (1896).

Villa Nova de Gaia. See GAIA.

Villa Nova de Portimão. See PORTIMÃO.

Villanueva de Cordoba, tn., Spain, prov. of and 34 m. N. by E. of Cordova. Pop. 9,800.

Villanueva del Arzobispo, comm., Spain, prov. of and 50 m. N.E. of Jaen. Pop. 7,500.

Villanueva de la Serena, city, prov. Badajoz, Spain, 63 m. E. of Badajoz. It is noted for melons and wine. Pop. 13,500.

Villanueva del Grao. See GRAO.

Villanueva - y - Geltru, tn., prov. Barcelona, Spain, on Mediterranean, 25 m. S.W. of Barcelona; centre of production of 'Manchester goods.' Strong red wine is also produced. Pop. 12,000.

Villa Real, cap. of Villa Real dist., Portugal, in Traz-os-Montes prov., 47 m. E. by N. of Oporto. Pop. 6,800. The district has an area of 1,650 sq. m. and a pop. of 245,000.

Villa Real de Santo Antonio, port, Portugal, at the mouth of the Guadiana, which separates it from Spain. Its chief exports are copper ore, tunny fish, and sardines. Pop. 5,000.

Villari, PASQUALE (1827), Italian historian and statesman, was born at Naples. Exiled for political reasons in 1847, he sought refuge at Florence, where (save for three years as professor of modern history at Pisa, 1859-62) he has been ever since. In 1862 he was appointed to the chair of history at the Florentine *Istituto di Studi superiori*. At various times he was deputy, senator, and minister of instruc-

tion (1891). He is president of the Accademia de' Lincei. His books on *Savonarola* (1859-61; Eng. trans. by his wife, Linda Villari, an Englishwoman, 1888), *Machiavelli* (1877-82; Eng. trans. 1878), the *Barbarian Invasions of Italy* (Eng. trans. 1902), and *The Two First Centuries of Florentine History* (1893-4; Eng. trans. 1894-5) have revolutionized history-writing in Italy. His *Scritti sulla questione sociale in Italia* appeared in 1902, and *Da Carlo Magna alle Morte d'Arrigo vii.* in 1910.

Villa Rica, tn., Paraguay, 78 m. E.S.E. of Asuncion. It is a chief centre for the cultivation and manufacture of tobacco and yerba maté. Coffee and fruits are also grown. Pop. 25,000.

Villa Rosa, tn., Sicily, in prov. of and 10 m. N.E. of Caltanissetta; has sulphur mines. Pop. 12,300.

Villarreal, tn., Spain, in prov. of and 8 m. S.W. of Castellon de la Plana; has extensive orange groves. Pop. 16,000.

Villarrobledo, tn., Spain, in prov. of and 45 m. W.N.W. of Albacete. Pop. 10,000.

Villarrubia de los Ojos, tn., Spain, in prov. of and 22 m. N.E. of Ciudad Real. Pop. 5,300.

Villars, CLAUDE LOUIS HECTOR, DUC DE (1653-1734), marshal of France, was born at Moulins. A cavalry officer under Turenne, Condé, and Luxembourg, he commanded (1692) in the action of Pforzheim. During the peace of 1698-1701, Villars was entrusted with a secret diplomatic mission at Vienna. Appointed to the chief command in 1702, he led an army to the support of the elector of Bavaria, and winning the battle of Friedlingen, was made marshal of France. Dispatched to the Cévennes (1704), he humanely concluded a peace with the insurgent Camisards. In 1709 he was defeated by Marl-

borough at Malplaquet. Commander-in-chief in the Netherlands, he gained a victory at Denain in 1712, and brought about the peace of Rastatt (1714). Villars, in 1733, drove the imperialists from Milan and Mantua. He died at Turin. His *Mémoires* were published by De Vogüé (1884-7). See also *Lives* by De Vogüé (1888) and Giraud (1881).

Villarsia, a genus of Australian and South African herbaceous marsh plants, belonging to the order Gentianaceæ. They bear white or yellow flowers arranged in cymes.

Villa San Giovanni, vil. in Calabria, Italy, on the Straits of Messina, prov. of and 8 m. N. of Reggio. In the earthquake of Dec. 1908, 3,700 people are said to have perished here. Pop. 3,000.

Villasis, pueblo, Pangasinan prov., Luzon, Philippines, 24 m. S.E. of Lingayen, on the Agno R. and at the junction of several important highways. Pop. 12,600.

Villefranche. (1.) Town, dep. Rhône, France, 18 m. N.N.W. of Lyons, on the riv. Saône. Its chief industries are heavy cottons, steel cables for mines, wines (Beaujolais), agricultural implements, and motor cars. Pop. 16,000. (2.) Or VILLEFRANCHE-DE-ROUERGNE, cap. of Aveyron dep., France, on the Aveyron, 62 m. N.N.E. of Toulouse; its cathedral dates from the 14th century. In the vicinity occur lead and tin mines, phosphate quarries, and sulphur springs. Pop. (comm.) 8,300.

Villegas, ESTEBAN MANUEL (1596-1669), Spanish poet, born at Najera in Castile. As a boy he produced a series of Anacreontic erotic verses, which have had no equal in the language, and upon their publication, under the title of *Las Eroticas* (1617-18), took the world by storm. In 1620 an enlarged collection called *Amatorias* was issued.

Villehardouin, GEOFFROI DE (c. 1160 - c. 1213), French historian, was born at the castle of Villehardouin in Aube. Marshal of Champagne (1191), he went in 1201 to negotiate with the Venetians about the transport of the crusaders to the Holy Land. He took part in the expedition ending in the storming of Constantinople and the fall of the Greek empire. He rescued the crusading army at Adrianople from complete destruction by the Bulgarians. His *Conquête de Constantinople* is of great value, and narrates the events of the fourth crusade, from 1197 to 1207. See the edition by De Wailly (1882), and Sainte-Beuve's *Causeries du Lundi*, ix.

Villein, in feudal times, one who tenanted land by *villein*—i.e. by performing base or menial service to his superior. See SLAVERY.

Villejuif, comun., France, in Seine dep., forming a southern suburb of Paris. Pop. 7,000.

Villemain, ABEL FRANÇOIS (1790-1867), French author and politician, was born in Paris, and when barely twenty was appointed to the chair of rhetoric in the lyceum of Charlemagne. After the second restoration he became professor of eloquence to the faculty of letters. About the same time he entered the ministry as chief of the department of printing and publishing, and was afterwards named *maître des requêtes* to the Council of State. He became a member of the Chamber of Deputies (1830); was made a peer of France and vice-president of the Royal Council of Public Instruction (1832), and minister of public instruction (1839-44). His chief works were *Histoire de Cromwell* (1819); *Lascaris, ou les Grecs du XV. Siècle* (1825); *Cours de Littéra-*

ture Française (1828-30); and *Histoire de Grégoire VII.* (1873).

Villemarqué. See LA VILLE-MARQUÉ.

Villemomble, comm., France, in Seine dep., about 7 m. E. by N. of Notre-Dame, Paris. Gypsum is quarried. Pop. 8,000.

Villena, tn., Alicante prov., Spain, 28 m. N.W. of Alicante; has manufactures of soap, brandy, silk, and salt. Pop. 14,500.

Villena, ENRIQUE DE (1384-1434), Aragonese writer, looked upon by his contemporaries as a prodigy of learning. He wrote an art of poetry (*Arte de Trovar*), and was a principal promoter of the affected poetical contests then in favour with the Spanish courts. He translated the *Æneid*, and much of Dante; and there survives a curious work of his on the art of carving and serving food, and a dissertation on the evil eye. The church burnt most of his books after his death. See Cotarello y Mori's *Don Enrique de Villena* (1896).

Villeneuve, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE (1763-1806), admiral of France, was born at Valensoles (Basse-Alpes). He was in command of the rear division of the French fleet at the battle of the Nile. He was then appointed to command the Toulon fleet, and engaged Sir Robert Calder off the Azores. Blockaded in the harbour of Cadiz by Nelson, he ventured out, and lost all at the battle of Trafalgar (1805).

Villeneuve St. George's, comm., France, in Seine-et-Oise dep., on the Seine, 10 m. S.E. of Notre-Dame, Paris. Pop. 9,600.

Villeneuve-sur-Lot, tn., dep. Lot-et-Garonne, France, 15 m. N.N.E. of Agen; has manufactures of boots, paper, and linen. It also has a trade in agricultural produce and wine. Pop. 13,500.

Villeroi, FRANÇOIS DE NEUVILLE, DUC DE (1644-1730), was brought up at the court of Louis XIV. He was made a marshal in 1680, but showed incapacity both in the Netherlands and in Italy, where Prince Eugene took him prisoner at Cremona. Marlborough defeated him at Ramillies (1706). Through Madame de Maintenon's influence he was made guardian of Louis XV.

Villers-Cotterêts, comm., France, in Aisne dep., 42 m. N.E. of Paris. Alexandre Dumas (père) was a native. Pop. 5,300.

Villerupt, comm., France, in Meurthe-et-Moselle dep., 87 m. E. by N. of Rheims, on the German frontier; has blast-furnaces. Pop. 6,600.

Villeurbanne, comm., France, in Rhône dep., 3 m. E. of Lyons; manufactures chemicals, bronzes, and liqueurs. Pop. 34,000.

Villiers. See BUCKINGHAM, DUKE OF, and CLARENDON, EARL OF.

Villiers, BARBARA. See CASTLEMAINE, COUNTESS OF.

Villiers, CHARLES PELHAM (1802-98), English statesman and reformer, born in London, and called to the bar at Lincoln's Inn (1827). He was returned M.P. for Wolverhampton (1835), and retained that seat until his death. A strong free-trader, his persistency secured the abolition of the corn-laws (1846). He was president of the Poor Law Board, with cabinet rank (1859-66).

Villiers, FREDERIC (1852), English war correspondent and artist, was born in London, and is widely known as the war artist for the *Graphic*. He was in Servia (1876); with the Russian army in Turkey (1877); in Afghanistan (1878); at Tell-el-Kebir (1882); in the 'broken square' at Tamai (1882); with the Nile expedition (1884), and at the battles of Abuklea and Gubat (1885). He was attached to the Australian con-

tingent during the S. African war (1899-1902), and was at Port Arthur during the Russo-Japanese war (1904-5), with the Spanish army in Morocco (1909), and with the Italians in Tripoli in 1911. He has published *Pictures of Many Wars* (illus. by himself, 1902); *Port Arthur* (with original sketches, 1905); and *Peaceful Personalities and Warriors Bold* (1907).

Villiers de l'Isle-Adam, PHILIPPE AUGUSTE MATHIAS, COUNT (1840-89), French poet, was born at Saint-Brieuc in Brittany. He wrote a large number of dramas and poems, among them *Isis* (1862); *La Révolte* (1870); *Le Nouveau Monde* (1883); *Une Évasion* (1887); *Axel*; *Elen* (1862), and *Morgane* (1862); *Contes Cruels* (1883); *Tribulat Bonhomiet* (1887); *Akédyséril* (1888); and two philosophical romances, *L'Amour Suprême* and *L'Eve Future* (1886). See *Life*, in French, by Pontavise de Heussy (Eng. trans. 1894).

Villingen, tn. in grand-duchy of Baden, Germany, in the Black Forest, 30 m. E. by N. of Freiburg; manufactures clocks, pottery, and ribbons. Villingen has a fine town hall and an interesting old church. Pop. (1910) 10,926.

Villon, FRANÇOIS (1431-c. 1485), French poet, whose original name was Corbueil or De Montcorbier, was born in Paris. In 1455 he was banished for killing a priest in a street brawl, but in 1456 received a pardon, and on his return to Paris wrote his celebrated poem *Le Petit Testament*. In 1457, for some offence, he was sentenced to death, after submitting to the 'ordeal by water;' but having obtained a respite, he was again banished. In 1461 he turned up in prison at Meung-sur-Loire. This time he owed his escape to a jail delivery on the accession of Louis XI., when he wrote his greatest work, *Le Grand Testament*. Rabelais brings

him to the court of Edward IV., and makes him, in his old age, retire to St. Maixent in Poitou. His poetry marked an era in the literature of Europe, displaying a strong capacity of feeling and expression, and a singularly mournful tone. Among his other poems are the *Ballade des Dames du Temps Jadis* and *Le Jargon*. *Les Repues Franches*, exquisitely translated by D. G. Rossetti, is wrongly attributed to Villon. The first dated edition of his poems is of 1489; good modern editions by Bibliophile Jacob (1854) and W. von Wurzbach (1903); and English translations have been made by Payne (1878), Swinburne, Lang, and Henley. See Profllet's *De la Vie et des Ouvrages de Villon* (1856); Campaux's *Villon sa Vie et ses Œuvres* (1859); Longnon's *Étude Biographique sur François Villon* (1877); and Bijvanck's *Spécimen d'un Essai Critique sur les Œuvres de François Villon* (1882).

Vilna. (1.) Government, W. Russia. Area, 16,421 sq. m. Pop. 1,900,000. The surface is mostly a sandy plain; the highest point, w. of Vilna city, reaches 1,020 ft. The government belongs to the Niemen and W. Dwina basins. Lakes and marshes are numerous. Black earth is found in the w., N.W., and N.E. Orchards and nurseries flourish. Domestic industries are mainly concerned with timber. The greater industrial establishments include flour, saw, and paper mills, distilleries, breweries, tanneries, glass and brick works. Of the population over one-half are Roman Catholics (Lithuanians and Poles), and nearly one-fourth Orthodox (White and Great Russians). (2.) Or VILNO, tn., W. Russia, cap. of Vilna gov., and of the old Lithuanian grand duchy, 190 m. E. of Königsberg in Prussia; is the seat of an Orthodox archbishop and of a Roman

Catholic bishop, with cathedrals of St. Nicholas and St. Stanislas—the former built 1596–1604, the latter originally a foundation of 1387 (as the metropolitan church of all Lithuania), but rebuilt in 1801; churches of St. John (1388), of St. Anne (c. 1390), of St. Mary (14th century), of the Holy Spirit (1441), of SS. Bernard and Francis (1469), of St. Theresa (1626); convents of the Trinity (c. 1490), of the Holy Spirit (1592). There are also an imperial palace, a valuable museum, and a botanical garden. Vilna is a river port, and manufactures buttons, gloves, tobacco, confectionery, pencils, boots and shoes, brushes, hats, and artificial flowers. Pop. 168,000.

Vilvorde, or **VILVOORDEN**, tn., Belgium, in Brabant prov., 7 m. N.N.E. of Brussels; manufactures lace, starch, and soap, and has tanneries and distilleries. Pop. 16,000.

Vimeiro, or **VIMEIRA**, vil., Estremadura prov., Portugal, 31 m. N.N.W. of Lisbon; was the scene of Wellington's victory over the French under Junot, Aug. 21, 1808. Pop. 700.

Vina del Mar. See **VALPARAISO**.

Vinca, a genus of herbaceous and shrubby plants, belonging to the order Apocynaceæ. They generally bear large, salver-shaped, axillary, solitary flowers, often of much beauty. The hardy periwinkles, grown as trailing plants in Britain, belong to this genus. The Madagascar periwinkle, or old maid (*V. rosea*), is a tropical plant, requiring stove or greenhouse treatment.

Vincennes. (1.) Fortified tn., dep. Seine, France, 1 m. E. of the fortifications of Paris, on the N. border of the Bois de Vincennes; has manufactures of chemicals and cartridges. The keep of its castle was the prison of Henry IV., Condé, Diderot, Mirabeau, and others. Pop. (comm.) 34,000.

(2.) City, Indiana, U.S.A., co. seat of Knox co., on Wabash R., 56 m. s. by w. of Terre Haute. The manufactures include flour, lumber, glass, and paper. Coal-mining is carried on in the district. Vincennes University was founded in 1806, and had 311 students in 1910. Pop. (1910) 14,895.

Vincent, SAINT (d. 304), born at Saragossa; became involved in the persecution of Diocletian (303). According to tradition, his heroism under his sufferings converted his jailer to Christianity. His day is January 22. He died at Valencia.

Vincent, SIR CHARLES EDWARD HOWARD (1849–1908), was born at Slinfold in Sussex. In 1878 he became director of the Criminal Investigation Department, metropolitan police, till 1884. He was a strong protectionist, and in 1891 founded the United Empire Trade League. He was elected M.P. for Central Sheffield (Conservative) in 1885. During the Boer war he took an active part in raising and organizing the C.I.V. contingent. He published *Russia's Advance Eastward* (1874); *Police Code and Manual of Criminal Law* (1882; 12th ed. 1904); *Military Geography, Reconnoitring, and Sketching* (1873); *Howard Vincent Map of British Empire* (13th ed. 1905); and works on the *Law of Criticism and Libel* (1876), and *Law of Extradition* (1881).

Vincent, WILLIAM (1739–1815), dean of Westminster, born in London. He was appointed rector of All Hallows in 1779, and became headmaster of Westminster (1801) and dean (1802). He was one of the best scholars in Europe, his chief works being *Defence of Public Education* (1801), *De Legione Manliana Quæstio* (1793), and *The Commerce and Navigation of the Ancients* (1807). See *Life by Nares* (1817).

Vincent de Beauvais (d. c. 1260), whose Latin name was Vincentius Bellovacensis, French Dominican monk, was tutor to the sons of Louis IX. He was the author of a huge Latin encyclopædia, entitled *Speculum Majus* (1473), and wrote religious works printed at Basel (1481). See Bourgeat's *Vincent de Beauvais* (1856).

Vincent de Paul, St. (1576-1660), founder of the Sisters of Charity, was born near Dax in the French Landes. After many adventures he settled in Paris (1609), where Margaret of Valois employed him as her almoner. It was as curé of Châtillon that he established his first Confrérie de Charité for the relief of the sick and poor. He next turned his attention to the galleys, and succeeded in ameliorating the conditions of the unhappy convicts. In 1619 François de Sales gave him direction of the first convent of the Visitation. At Chartres, Vincent organized the Congregation of the Missions, an association of mission priests. In 1632 the Society of the Lazarists arose under his care. In 1634 he created the Filles de la Charité, the first association of uncloistered women living by rule, and devoted to the care of the sick and poor. A branch of this community, the Dames de la Croix, was for the special service of the Hôtel Dieu at Paris. Vincent was the means of establishing the Foundling Hospital (1640) in that same city. He was beatified in 1729, and canonized a saint in 1737. His festival is on July 19. See *Life in French* by Chantelauze (1882) and Bougeaud (1889; Eng. trans. 1900), and in English by R. F. Wilson (1873), and James Adderley's *Monsieur Vincent* (1901).

Vinci. See LEONARDO DA VINCI.

Vindelicia, the ancient name of the most western of the four

Danubian provinces of the Roman empire. It included N.E. Switzerland, the s. of Württemberg and Bavaria, and the N. of Tyrol. Its inhabitants, the Vindelici, were of Celtic race. They were subdued by Tiberius in 15 B.C. Its chief town was Augusta Vindelicorum, the modern Augsburg.

Vindex, GAIUS JULIUS, a noble Gaul, who, when proprætor of Celtic Gaul in 68 A.D., urged his people to rebel against Nero, and allied himself with Galba. Most of the Roman governors in Europe declared for Galba; but Verginius Rufus, governor of Upper Germany, marched against Vindex, and besieged Vesontio. Vindex committed suicide.

Vindhya, a series of mountain ranges forming the N. scarp of the Deccan in India. Altitude, 1,500 to 4,500 ft.

Vine (*Vitis vinifera*). The plant has been cultivated for many thousand years, as we know from Israelite and Egyptian records. The plant seems to have been introduced into England in the second or third century. Of the varieties of the grape-vine cultivated under glass in Britain the following list includes the best:—Black Hamburg, Madresfield Court, Muscat, Buckland sweetwater, Muscat of Alexandria, Canon Hall Muscat, black Alicante, gros Colmar, Mrs. Pearsom, diamond jubilee, gros Maroc, gros Guillaume, Mrs. Pince's Black Muscat, and Lady Downe's. Vines make a more short-jointed, if less rapid, growth in a greenhouse, on account of the constant circulation of fresh air, than they do in a vinery proper. Assuming that the roots are planted outside, and the vines are taken into the house through an opening in the brickwork immediately under the wall-plate, liberal and frequent supplies of water should be given at the roots

(in the absence of rain) as the vines advance in growth. Even without a glass house it is possible to grow grapes, in the milder parts of Britain, against walls or fences facing south, west, or south-west. See Ward's *Book of the Grape* (1901).

Vinegar, the weak solution of acetic acid that is obtained by the oxidation of a dilute alcoholic liquor by the aid of the micro-organism *Mycoderma aceti*, or 'mother of vinegar.' The percentage of alcohol must not rise above ten. The liquors most often fermented are either a special kind of beer, from which 'malt' vinegar is obtained, or an inferior wine, from which 'white vinegar' or 'wine vinegar' is prepared, though cider is also employed to a small extent. In the 'slow vinegar process' the liquor is exposed in casks to the air, which is admitted through perforations. The process is assisted by periodical additions and removals of liquor, and lasts about six months. In the 'quick' process the solution, generally a malt liquor or diluted spirit containing bran or rye extract, is made to trickle through vats containing shavings, which are covered with *Mycoderma*.

All genuine varieties of vinegar contain esters, extractive and mineral matters, besides acetic acid, which should be present to the extent of from 5 to 7 per cent., the amount being usually expressed as the number of grains of sodium carbonate one fluid ounce will neutralize. White vinegar made from wine is pale yellow to red in colour. Potassium bitartrate is present; but it is absent from malt vinegar, which is of a brown colour and characteristic refreshing odour. Both varieties are imitated, white wine vinegar by distilled malt vinegar, and both by diluted acetic acid from the distillation of wood.

See Brann't's *Treatise on the Manufacture of Vinegar* (1902).

Vinegar Eel (*Anguillula aceti*), a small nematode commonly found in weak vinegar. See NEMATODES.

Vinegar Hill (alt. 389 ft.), in Co. Wexford, Ireland, 14 m. N. of Wexford; was the scene of the defeat of the Irish rebels by General Lake, June 21, 1798.

Vinegar Plant, a name given to various fungi, to whose activity is due the conversion of alcohol into vinegar, especially to the fungus *Mycoderma aceti*. This bacterium consists of rod-like cells, which are so joined as to form long filaments; these are embedded in a gelatinous substance so as to form a mass which floats on the surface of the fluid. Having finished its work, the vinegar plant falls a victim to various blue and green moulds which form on its surface.

Vineland, bor., Cumberland co., New Jersey, U.S.A., 31 m. s. of Camden. There are manufactures of shoes, glass, clothing, etc. Pop. (1910) 5,282.

Vinet, ALEXANDRE RODOLPHE (1797-1847), Swiss theologian and critic, was born at Ouchy, canton of Vaud. He was professor of French at Basel in 1817. In 1837 he became professor of theology at Lausanne. He joined the Free Church of Vaud, resigning his professorship in 1845. As a critic of French literature Vinet held a high place. His best books are *Christian Philosophy* (1846), *Vital Christianity* (1846), *Gospel Studies* (1851), *Pastoral Theology* (1852), *Studies in Pascal* (1859), *Outlines of Philosophy and Literature* (1865)—all translated into English. His *Lettres* were published by Secretan and Rambert (1882), and by De Pressensé (1890). See *Lives*, in French, by Chavannes (1883) and Molines (1890); in English, by Laura M. Lane (1890).

Vinga. See THERESIOPOLIS.

Vingt-et-Un. See GAMBLING.

Vinh, or VINH-LONG, tn., cap. of prov. Vinh, French Cochinchina, on a branch of the Mekong delta, 10 m. from the sea, midway between Hanoi and Hué. Pop. 16,000. The province has a population of 1,200,000.

Vinje, AASMUND OLAFSSÖN (c. 1818-70), Norwegian author, born at Vinje in Upper Thelemark. An acquaintance with Ivan Aasen induced him to adopt the *Maal* as his literary language, and in 1858 he began the publication of a weekly review in that dialect entitled *Dölen*, which speedily made him famous. In 1862 he received a stipend from the state to enable him to study the working of the jury systems in England and Scotland, the fruits whereof appeared as *A Norseman's Views of Britain and the British* (1863). In 1865 he received a clerkship in the Norwegian Department of Justice, but he 'wrote himself out of this post' by articles in *Dölen* in 1868. His most important book was *Storegut* (1866), a narrative poem. A selection of his works (*Skrifter i Utval*) was published in 5 vols. (1883-90). He was a successful translator of Byron. See V. Vislie's *Aasmund Vinje* (1890).

Vinkovce, tn., Croatia-Slavonia, Hungary, 20 m. S.S.E. of Eszek. Pop. 6,000.

Vinnitsa, tn., Podolia gov., S.W. Russia, 92 m. E.N.E. of Kamennets, on the S. Bug; with manufactures of tobacco, soap, candles, carts and carriages. Pop. 30,000.

Vint, a game at cards, resembling bridge, and much played by Russians. 'The value of the various suits, except for scoring purposes, is the same [as in bridge]; the manner of the play, after the declaration of trumps, is as in bridge, and it is a game for four players; but there is no dummy,

and the making of the declaration is, as it were, put up to auction' (Oswald Crawford). But the scoring for honours and other chances of the game is relatively high as compared with the scoring for skill in play.

Vintar, pueblo, Ilocos Norte prov., Luzon I., Philippines, 5 m. N.E. of Laoag. Pop. 9,500.

Viol, the generic name given to the immediate precursors of the violin, viola, violoncello, and double-bass. The viol differed from the first three in having a flat back, slanting shoulders, sound-holes of another form, and a greater number of strings. The double-bass has the flat back and contour of the viol, but sound-holes like those in the violin.

Viola, or TENOR VIOLIN. See VIOLIN.

Viola, a genus of perennial herbaceous plants belonging to the order Violaceæ. Most of the species are dwarf plants. The sweet violet is *V. odorata*; the dog violet, *V. canina*; the heart-ease or pansy, *V. tricolor*. The garden hybrids known as violas or tufted pansies are among the most beautiful of plants.

Violaceæ, a natural order of herbs and shrubs, widely distributed over temperate and tropical regions. There are twenty-one genera, including *Viola* and *Hymenanthera*.

Violet, the popular name given to *Viola odorata*. There are white, blue, and purple varieties, and of these there are double sub-varieties.

Violin. Gasparo Bertolotti—better known as Gaspar di Salò—(d. 1610) of Brescia, Lombardy, seems to have been the first maker of violins. The violin has a hollow, resonant, oblong body, narrower in its upper portion, consisting of a back and a breast—both of which are convex—attached to and slightly overlapping narrow sides or ribs. The

upper and lower extremities are rounded, and on each side of the instrument, a little above its centre, there are two inward curves, formed somewhat like the letter C. The narrow portion between the curves is termed the waist. On the breast in the lower portion of, and extending a little below, the waist, there are two longitudinal incisions, one on each side, formed like the letter f, and called f or sound holes. Their dimensions, degree of inclination towards each other, and distance from the sides and from the upper and lower extremities, have each and all considerable influence upon the tone of the instrument. Attached to the centre of the upper part of the violin is a neck, the prolongation of which is a head, usually terminating in the form of a scroll. An ebony finger-board and nut—a narrow ridge containing four tiny grooves placed at the upper end of the finger-board—are glued to the flat surface of the neck. The head contains four tuning pegs, two on each side, to which the upper ends of the strings are secured, the lower ends being fastened in a tail-piece attached to the bottom of the instrument. In the inside of the violin there are four small blocks, which fill up the respective corners. A larger block placed at the centre of the lower end contains the tail-pin. A similar block is placed at the centre of the upper end, and to this the neck is attached. The back at this part contains a little semicircular projection, termed the button. The lower end of the neck is let into the block, so that the under horizontal surface of the neck rests against this button and against a portion of the back; by this means the neck is firmly united to the body of the instrument. The sides are bent to shape, and are only about $\frac{1}{8}$ in. thick. To

strengthen these, and also to provide a broader surface for the attachment of the back and breast, the parts between the blocks have their edges thickened by means of tiny strips of wood called linings, which are bent to fit the inner curves of the sides, and are glued to them. The blocks and linings are usually made of pine, but willow, lime, and cedar are also used for these parts. The bass-bar is a little beam of pine, glued longitudinally but somewhat obliquely to the inner surface of the breast, and in such a position that the left—or G string—foot of the bridge is over the centre of the bar. The proportions and adjustment of the bass-bar require the nicest calculation in order to secure the best tonal results. The sound-post is a small movable pillar of pine, usually about $\frac{1}{4}$ in. in diameter, which stands upright between the back and the breast. It is usually from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. behind the right foot of the bridge—i.e. nearer the lower end of the instrument. If a violin is too high in build, the tone lacks volume; if too low, it lacks sympathetic quality; and in both cases the balance of tone between the upper and lower registers is unequal. Many of the best violins of Stradivari and Joseph Guarneri have a total depth of about $2\frac{3}{4}$ in., the height of arch in back and breast being about half the height of the sides. The breast is always made of pine, and may be of one thickness all over, but is frequently thickest at the centre. The back, sides, neck, and head are almost invariably made of maple or sycamore; but these parts have also been made of beech and of birch. If the back and breast are too thin, the tone of the violin lacks solidity, and is easily played out; if too thick, the tone is thin and shrill, be-

sides being difficult of production. The strings are raised above the lower end of the finger-board, and have their vibrations communicated to the instrument by means of the bridge, which is movable and cut from a single piece of maple. It received its present form from Stradivari, and its artistic design is necessary to its properly fulfilling its functions. Too high a bridge makes the tone dull and slow of response, while if too low the tone becomes hard and piercing. The exterior of the violin is coated with varnish, which not only enhances the beauty of the instrument, but greatly affects its tone. Oil varnish gives better results than spirit varnish. Cremona violins are famous for the quality of their varnish, but after 1760 its secret seems to have been lost. An ordinary full-size violin is 14 in. in length of body, exclusive of the neck and head. The length of string from nut to bridge should not be more than 13 in.; great players seldom use a string longer than 12½ in.

The violin is strung with four strings tuned in fifths. The highest, or first, is tuned to the note E on the highest space of the treble staff; the second, third, and fourth strings are tuned respectively to the notes A, D, G below. The strings are made of gut, but firsts of silk are also used. The fourth string is covered with spun wire, pure silver being most in favour. In order to produce the desired intervals of pitch, the strings are stopped as required by the finger tips of the left hand. By the use of a small wood or ivory instrument, the 'mute,' a peculiarly soft tone, of muffled and tremulous quality, is obtained. Music for the violin is always written in the treble clef, and the compass of the instrument is about four octaves, but this can

be extended by the use of harmonics.

The violin is sounded by having its strings set in vibration by a band of rosined horse-hair, which forms part of a bow.

The viola or tenor violin is about a seventh larger than the violin, and is held and played in the same manner. Its four strings are tuned in fifths, one fifth lower than the violin, its notes, numbering from the highest string, being A, D, G, C. The two lower strings are covered with spun wire, and music for the instrument is written in the alto clef. The violoncello, or 'cello, is about twice the size of the violin, but its sides are deeper in proportion. Its four strings are tuned to the same notes as those of the viola, but are one octave lower, and its two lower strings are also covered with spun wire. Music for the 'cello is written in the bass clef, the tenor and treble clefs being also used for passages in the higher positions of the instrument. The double-bass is about twice the size of the 'cello, but has a flat back and sloping shoulders. It may be strung with three or with four strings, and in either case it may be tuned in various ways. A frequent method of tuning with four strings is G for the first or highest string, and D, A, E for the second, third, and fourth strings. Stringed instruments by the great Italian makers are considered superior to all others. Several instruments by Antonius Stradivari have each brought £2,000, while £1,850 has been given for a violin by Joseph Guarneri (I.H.S.). Among other distinguished Italian makers are Amati, Bergonzi, Gagliano, Granino, Guadagnini, Maggini, Montagnana, Ruggierius, and Gasparo di Salo. 'Cellos by eminent makers command as high prices as violins. See Hart's *The Violin*

(4th ed. 1887); H. Allen's *Violin-making as it was and is* (1884); W. H. Mayson's *Violin-making* (1895); H. Saint-George's *The Bow: its History, Manufacture, and Use* (1897); Haweis's *Old Violins* (1898); W. M. Morris's *British Violin-makers* (1904); Ragster's *Chats on Violins* (1905); and Abele and Neiderheitmann's *The Violin: its History and Construction* (Eng. trans. 1907).

Viollet-le-Duc, EUGÈNE EM-MANUEL (1814-79), French architect, born in Paris; was engaged upon the restoration of the Sainte-Chapelle in Paris (1840), Notre Dame (1845), and the abbey of St. Denis (1846). He wrote many able works, among them *Dictionnaire de l'Architecture Française du XI.-XVI. Siècle* (1853-69) and *Chapelles de Notre Dame de Paris* (1869). A number of his works have been translated into English. See *Lives*, in French, by Sauva-geot (1880) and Saint-Paul (1881).

Violoncello, or 'CELLO. See VIOLIN.

Vionville, vil., Lorraine, Germany, 12 m. w. of Metz; was the scene of a desperate encounter—known also as Mars-la-Tour—(Aug. 16, 1870) between the Germans under Prince Frederick Charles and the French under Marshal Bazaine.

Viotti, GIOVANNI BATTISTA (1753-1824), Italian violinist and musical composer, born at Fontanetto in Piedmont. He appeared with much success in Germany, Russia, and England before settling in Paris (1782). From 1795 he resided chiefly in London, where he died. He was the greatest violinist of his time. Many of his compositions are still standard works.

Viper (*Vipera*), a genus of poisonous snakes, including about ten species found in Europe, Asia, and Africa. For the British species see ADDER. In India and in

neighbouring countries there occurs the dangerous Russell's viper or daboia (*V. Russellii*), which reaches a length of five feet. To the family Viperidæ belong not only the vipers and their allies, but also the deadly rattle-snakes. To the subfamily Viperinæ, which is confined exclusively to the Old World, belong not only the vipers in the restricted sense, but also the puff adder (*Bitis arietans*) of Africa and the African horned vipers (*Cerastes*).

Viper's Bugloss (*Echium vulgare*), a native British plant belonging to the order Boraginacæ. It is found growing on walls, in gravel pits, and similar places. It is a bristly plant, growing to three feet in height; has narrow, prickly leaves, and bears numerous short curved spikes of blue flowers in summer.

Vipsania, daughter of M. Vipsanius Agrippa and wife of Tiberius, bore the latter a son, Drusus; but in 11 B.C. Augustus caused them to be divorced, in order that Tiberius might marry his daughter Julia. Vipsania died in 20 A.D.

Vipsanius. See AGRIPPA.

Viramgam, munic. tn., Ahmadabad dist., Bombay Presidency, India, 37 m. w. of Ahnabad; an important cotton entrepôt. Pop. 19,000.

Viravanallur, tn., Tinnevely dist., Madras Presidency, India, 12 m. s.w. of Tinnevely, and about 40 m. N. by E. of Cape Comorin. Pop. 17,500.

Virchow, RUDOLF (1821-1902), German anthropologist, pathologist, and politician, was born at Schivelbein, Pomerania. He was given an appointment at the University of Berlin in 1847, and the same year sent by the government to investigate typhus fever in Silesia. His report was so outspoken as to cause a good deal of official disquiet; and his democratic creed brought about the

loss of his university appointment. He had already founded (1847) the *Archiv für Pathologische Anatomie*, which he edited until his death. He was largely responsible for the encouragement given to Scalliemann in his excavations at Troy; and he wrote two books on Troy, *Zur Landeskunde der Troas* (1880) and *Alttröjanische Gräber und Schädel* (1882). On losing his appointment in Berlin he was offered the chair of pathological anatomy at Würzburg (1849), and there he remained until, in 1856, Berlin University invited him to return. The pathological museum of the Berlin University is one of the many monuments that demonstrate Virchow's industry. His great work on *Cellular Pathology* (1858; Eng. trans. 1860), and that on *Tumours*, which was never completed (1863-67), are his best-known books; but there is practically no department of medicine on which he has not written learnedly. In his *Cellular Pathology* he took for his motto '*Omnis cellula e cellula*' ('All cells from a cell'); and that was the theory, or rather the fact, on which all his medical work was based. He was the first to apply the cell theory to the consideration of diseased tissues. He for a long time led the Radical party in the Prussian Chamber, and was a constant opponent of Bismarck.

Viriden, tn., Manitoba prov., Canada, 182 m. by rail w. of Winnipeg. Pop. 2,300.

Vire, comm., France, in Calvados dep., on the Vire, 35 m. s.w. of Caen; manufactures hosiery and woollens, and has granite quarries. Pop. 6,300. In the vicinity is the Vaux-de-Vire ravine, where lived Olivier Basselin, a 15th-century poet, whose satirical songs received the name of *Vau-de-Vire*, from which the modern word *vaudeville* is said to be derived.

Virgil (70-19 B.C.), whose full name was Publius Vergilius Maro, the greatest of Roman poets, was a native of Andes, near Mantua. The correct spelling of the name in Latin is with an *e*, not with an *i*; the spelling Virgilius is first found in the 5th century A.D., and acquired vogue after the 9th century. He was given a good education at Milan and in Rome (after 53 B.C.), where the Emperor Augustus was, it is said, his fellow-pupil. In 41 he went to Rome, and became one of Mæcenas's circle of friends, among the members of which were the poets Horace and Varius. The rest of his life was spent in literary work and study: his *Georgics* appeared about 30 B.C., and his remaining years were devoted to the composition of his *Æneid*. He died at Brundisium. The *Bucolics*, mostly descriptive of rustic life, are imitations, almost translations, from Theocritus. The *Georgics* deal with agriculture, arboriculture, domestic animals, and bees and bee-keeping. It is a didactic poem, much influenced by Hesiod; but the skill with which the topics are elevated and idealized, and the beauty of its episodes, make it the most perfect of the greater works of Roman poetry. The *Æneid*, begun in 29 B.C., was left unfinished at the poet's death. Its subject is the settlement of Æneas in Italy after the destruction of Troy. The first six books resemble the *Odyssey*, the last six the *Iliad*; but the fourth owes much to Apollonius Rhodius's *Argonautica*. The story of Æneas was not a living Roman legend, though it had been officially adopted at Rome for two centuries; and Virgil himself was not naturally fitted to be an epic poet, if the only subject of an epic be war. Hence there is an air of effort and unreality about the last six books of the poem; the

battle scenes, above all, are clearly written by a student, not by a man of action: the imitation of Homer is too obvious. Yet the poem remains the noblest monument of Roman character and of Roman poetic genius. One great charm of the poem is the frequent expression in perfect language of thoughts, common indeed, which touch the human heart in every age; and above all, there is the unsurpassable Roman dignity which colours the whole poem, maintained and expressed by the poet's perfect command of language and rhythm. From the point of mere style the poem has never been surpassed. The minor works ascribed to Virgil are *Culex* and *Ciris*, two small epic poems; *Moretum*, a description of a peasant's breakfast; *Copa*, 'mine hostess,' a short elegiac poem in a sprightly tone; and *Catalepton*, short poems on various subjects. Of all these poems no more can be said here than that they date from Virgil's time, and may quite well be his work. Virgil at once gained the greatest reputation; his works were regularly studied in schools, and later consulted as oracles. In the middle ages Dante regarded Virgil as his chief teacher, and in popular tradition he was considered the greatest of magicians and necromancers owing to the use of his poems as oracles. The scene of his exploits was Naples, which, as the place of his burial, was the origin of these legends. For these, see Jean d'Outremeuse's *Les Faits Merveilleux de Virgile*, a 15th-century work (modern ed. 1867), and Comparetti's *Virgil in the Middle Ages* (1872). Good editions of Virgil have been published—the text, by Ribbeck (new ed. 1895), Nettleship (1890), Page (1895), Papillon and Haigh (1895); and with notes, by Conington and Nettleship (1881-4), Sidg-

wick (1890), Papillon and Haigh (1890-1). Translations have been made into English verse by Dryden (1697), Palmer (*Bucolics*, 1883), Bowen (*Bucolics* and *Aeneid*, i.-vi. 1889), Conington (*Aeneid*, 1870), Morris (*Aeneid*, 1876); and into English prose by Conington (1888), Mackail (1885 and 1889). See also Henry's *Aeneidea* (1873-92), Nettleship's *Introduction to the Study of Virgil* and *Ancient Lives of Virgil* (1879), Sellar's *Roman Poets of the Augustan Age* (1877), Mayor, Fowler, and Conway's *Virgil's Messianic Poem* (1907), W. R. Hardie's *Lectures on Classical Subjects* (1903), and W. Warde Fowler's *Gifford Lectures on Roman Religion* (Edin. 1909-10).

Virgil, POLYDORE. See VERGIL.

Virginal. See SPINET.

Virginia, one of the eastern states of the United States of America, with an area of 42,625 sq. m., of which 2,365 sq. m. are water. It was one of the thirteen colonies and an original state. It fronts on the Atlantic, and extends to the Alleghany range in the Appalachian Mts. The highest elevations are Rogers Mt. (5,719 ft.) and White Top (5,530 ft.). Its eastern part is low and level, and near the coast contains marshlands, the largest being the Dismal Swamp. Further inland the contour rises and becomes more broken. The Blue Ridge, the easternmost member of the Appalachian system, crosses the state in a south-westerly direction, reaching altitudes of 4,000 ft. West of it is a broad valley, drained by the Shenandoah, James, and New rivers, and branches of the Tennessee, and intersected by numerous parallel ridges. The largest rivers are the Potomac, on the northern boundary, the Rappahannock, James, Appomattox, Roanoke (Staunton), and New. The capital and largest city is Richmond,

at the head of navigation on the James. The chief ports are Norfolk and Newport News. The University of Virginia is situated at Charlottesville, and had 699 students in 1910. The industries are to a great extent agricultural (during 1910 160,000 acres were under tobacco, producing 124,800,000 lbs.). The principal crops are tobacco, cotton, Indian corn, wheat, and oats. The principal manufactured products are tobacco, flour, lumber, iron and steel, and steam cars. The mineral wealth consists mainly of iron ore and coal. Virginia is one of the foremost states in the value of its fisheries, especially of oysters. In 1910 there were 6,600 m. of steam railways in Virginia. Pop. (1910) 2,031,612. See C. R. Lingley's *The Transition in Virginia from Colony to Commonwealth* (1910); P. A. Bruce's *Institutional History of Virginia in the Seventeenth Century* (1910); C. H. Ambler's *Sectionalism in Virginia* (1910); and J. E. Cooke's *Virginia* (1900).

Virginia, city, St. Louis co., Minnesota, U.S.A., 56 m. N.N.W. of Duluth. The city is the centre of a group of iron mines, and has amongst its industrial establishments lumber mills, foundries, machine shops, and car shops. Pop. (1910) 10,473.

Virginia, WEST. See WEST VIRGINIA.

Virginia, a maiden of ancient Rome. In 449 B.C. Appius Claudius, chief of the decemvirs, ordered a client of his, M. Claudius, to claim Virginia, the daughter of a slave of his. The case was brought before Appius; but when he adjudged Virginia to his client, a riot ensued. Virginia's father, Virginius, seeing no other escape for his child, snatched up a butcher's knife from a stall, and plunged it into her bosom. He then escaped and inflamed the army with the tale, and soldiers

and citizens rose against the decemvirs. Appius was imprisoned, and killed himself in prison. The story is, however, probably only an invention to explain the fall of the decemvirate. It is well told in Macaulay's *Lays of Ancient Rome*.

Virginia City, cap. of Storey co., Nevada, 15 m. N.E. of Carson City, on the E. slope of Mt. Davidson, at an elevation of 6,000 ft. The city has been noted for its gold and silver mines, especially the famous Comstock Lode and the Big Bonanza or Consolidated Virginia. Pop. (1910) 2,244, formerly much larger.

Virginia Creeper, a group of hardy climbing shrubs belonging to the order Vitaceæ. They may be distinguished from the allied plants belonging to the genus *Vitis* by the pith of their branches being white, whilst that of *Vitis* is brown. They may be easily propagated by cuttings. Veitch's Virginia creeper (*Ampelopsis Veitchii*) is about the best for clinging to walls. It bears the atmosphere of cities well.

Virginian Deer (*Cariacus virginianus*), a type of the American deer of the genus *Cariacus*, in which the antlers are either in the form of simple spikes, or, when branched, have no brow tine, always divide in a forklike fashion, and have the anterior prong directed forwards. The animal ranges throughout N. America, and occurs in several well-marked varieties, which are sometimes given specific rank. The general body colour in summer is bright bay, whence the common name of 'red deer.' In winter the colour becomes gray.

Virginian Quail, or BOB-WHITE (*Ortyx virginianus*), a member of the subfamily Odontophorinæ, which includes American game birds that are quail-like in appearance and are sometimes called partridges. The bob-white

is found in the eastern United States, and receives its name from the note of the male. It is partridge-like in its habits, and an attempt has been made to introduce it into England, but without success.

Virginian Stock (*Malcomia maritima*), a hardy annual European plant, belonging to the order Cruciferae. It bears racemes of white, lilac, or rose-coloured flowers, with a sweet fragrance.

Virginia University, at Charlottesville, Virginia, U.S.A., founded (1819) by President Jefferson and opened in 1825. The buildings were planned and erected under his personal supervision, and form one of the finest pieces of academic architecture in America. The students numbered 784 in 1909.

Virginia Water, lake in the Great Park of Windsor, Berkshire, England, 5 m. s. of the castle; was constructed in 1746 by the Duke of Cumberland.

Virgin Islands, the most northern group of the Lesser Antilles, were discovered by Columbus in 1494. The largest are Crab or Vieques, Culebra, St. Thomas, St. John, Sainte Croix, Tortola, Virgin Gorda, and Anegada. They are all mountainous, projecting above the water like tips of submerged peaks, and are very rugged. The total area aggregates 328 sq. m. The total population is about 50,000. Crab and Culebra were Spanish, but now belong to the United States; area, about 130 sq. m.; pop. 12,000. The Danes own St. Thomas, Sainte Croix, and St. John; area, 140 sq. m.; pop. 33,000. Anegada, Virgin Gorda, Tortola, and a number of smaller islands, belong to Great Britain, with a total area of 58 sq. m. and a pop. of 5,000, the chief town being Roadtown in Tortola. The majority of the population

are negroes. The town of St. Thomas was formerly the commercial metropolis of the W. Indies.

Virgin Mary. See MARY, THE VIRGIN.

Virgo, the sixth sign of the Zodiac (symbol MX), entered by the sun about August 21, and an ancient constellation. The figure primitively represented the Euphratean goddess Ishtar; but Aratus identified it with Astraea, other Greek writers with Demeter or Persephone. Its harvesting associations survive in the name Spica of the principal star; while ϵ , of 3.0 magnitude, is designated Vindemiatrix in the Alfonsine Tables. The fine binary γ Virginis is composed of two straw-yellow stars of 3.6 magnitude, both slightly variable, mutually revolving in 180 years. η Virginis is a spectroscopic binary with a period of 72 days. The great nebulous region centred on the north galactic pole covers the head and breast of Virgo. The most remarkable of the objects collected there is the large spiral, Messier 99, photographed by Dr. Roberts in 1896.

Viriathus, a native of Lusitania—roughly Portugal—who gained command of his tribe in 147 B.C., and in that year defeated a Roman propraetor, destroying 4,000 out of 10,000 Romans. Next year he defeated the praetor Plautius, and in 145 Claudius, though later in that year the consul Fabius expelled him from the Roman provinces in Spain. In 141 B.C. Viriathus surrounded the army of the proconsul Servilianus; but the latter made a treaty with him recognizing the independence of Lusitania. Next year, however, the consul Servilius Cæpio renewed the war, and successfully bribed the envoys whom Viriathus sent to him to murder their general.

Viridian, or GUIGNET'S GREEN, a hydrated chromic oxide, obtained by decomposing borate of chromium with water. It is a permanent, harmless, and rich-coloured pigment.

Virtues. See CARDINAL VIRTUES.

Virues, CRISTOVAL DE (c. 1550-1619), Spanish dramatic and epic poet, born at Valencia, was an intimate friend of Lope de Vega. Like Lope, he followed for some time the profession of a soldier; but between 1579 and 1581 he wrote five famous tragedies (first printed 1609), by name *Cassandra*, *Marcella*, *El Atila Furioso*, *Semiramis*, and *Elisa Dido*; an epic poem, *Monteserrate*; and a number of lyrics.

Virus, in medicine, the poison produced in the body when suffering from an infectious disease. It can, by inoculation, excite the same disease in another. See BACTERIOLOGY, POISONS, VACCINATION, INFECTION.

Visby. See WISBY.

Viscacha, or PAMPAS HARE (*Lagostomus trichodactylus*), a South American rodent, nearly allied to the chinchilla, but found only in the open pampas. Viscachas have five toes on the fore feet and three on the hind, and are strongly and somewhat clumsily built. The length of the head and body in a full-grown animal is about twenty-three inches, the tail being about seven inches. See Hudson's *Naturalist in La Plata* (1892).

Vischer, FRIEDRICH THEODOR VON (1807-87), German writer on æsthetics and philosophy, born at Ludwigsburg in Würtemberg; became professor of æsthetics at Tübingen (1837), and was elected a member of the Parliament of Frankfort (1848). He was promoted to a professorship at Zürich (1855), and occupied a similar post at Stuttgart (1866-77). His principal works are

Æsthetik (3 vols. 1847-58); the novel *Auch Einer* (1878); *Altes und Neues* (1881-9); *Kritische Gänge* (1844-75); and, under the pseudonym of 'Schartenmeyer,' the poem *Der Deutsche Krieg, 1870-71* (4th ed. 1874). See *Lives*, by Günthert (1888), Frapan (1889), Ziegler (1893), and Oswald (1896).

Vischer, PETER (1455-1529), German sculptor, was born at Nuremberg, and executed the monument of Archbishop Ernst at Magdeburg (1497), of King Arthur at Innsbruck, and the tomb of St. Sebald at Nuremberg (1508-19). He had five sons, all eminent sculptors, the eldest of them, Hermann (d. 1516), being the best known. See Bergau's '*Peter Vischer und seine Söhne*' in Dohme's *Kunst und Künstler*.

Visconti, a noble Lombard family, which is first mentioned in the 11th century. OTTONE (b. 1208) became the first lord of Milan, having headed the Ghibellines and defeated the Della Torres (who, however, resumed sway for a short period—1302-11). GALEAZZO (1277-1328) extended his dominion over Lombardy. LUCCHINO (b. 1287, murdered 1349) was a harsh but successful ruler, and a patron of arts and letters, receiving, among others, Petrarch at his court. The succeeding princes lost much of their territory, but everything was won back by the greatest of the Visconti, GIAN GALEAZZO (c. 1347-1402), who did a great deal for art, literature, and science at Milan, Pavia, and Piacenza. When he died (of the plague) he was aspiring to the kingdom of Italy. (See monographs by Belgoioso, 1861; and Romano, 1891.) His daughter VALENTINE (d. 1408) married in 1389 Louis, Duke of Orleans; and it was on the strength of this marriage that Louis XII. of France eventually claimed Milan. With their third son, FILIPPO MARIA (1391-

1447), the male line of the Visconti died out. His daughter, MARIA BIANCA (d. 1468), married Francesco Sforza.

Visconti - Venosta, EMILIO, MARQUIS (1830-1906), Italian statesman, born at Milan; became a follower of Mazzini, but left the conspirators in 1853, and in 1859 was appointed royal commissioner with the forces of Garibaldi. He was foreign minister in the Minghetti cabinet (1863-4), and in the Lanza-Sella cabinet (1869-76). In 1886 he was appointed senator, and in 1896 he accepted the portfolio of foreign affairs in the Rudini cabinet, and again in 1899 in the Pelloux and Saracco cabinets till 1901. In 1906 he was selected to represent Italy at the Morocco conference which met at Algeciras. In 1904 he published *Ricordi di Gioventù*.

Viscosity, the property of matter in virtue of which it resists, but at the same time yields under the action of shearing forces. It differs from elasticity inasmuch as it does not imply any power of recovery when the distorting force is removed. Viscosity is specially marked in fluids, and is sometimes called fluid friction. Its effect is to destroy all relative motion in the fluid. The decay of waves, the lulling of wind, are examples of the effects of viscosity. Fluids differ greatly in the amount of their viscosity, from extremely mobile liquids such as ethyl ether or water to highly viscous fluids such as glycerin, tar, or treacle. In the case of gases and liquids viscosity is due to the diffusion of molecules between contiguous layers which are moving with different speeds. The more energetic molecules of the more quickly moving layer pass into the more sluggish layer, and increase its momentum. Similarly the more sluggish molecules move into the more rapid layer, and decrease its momentum.

Viscosity, in fact, is defined as the diffusion of momentum. When a wire is set oscillating either flexurally or torsionally, it gradually loses energy and comes to rest. This loss is due partly to the friction of the air through which it moves, and partly to the viscosity of the solid material itself.

Viscount, a sheriff who acted as deputy for the count, or lord-lieutenant, of a county; older in this sense than as a title of nobility ranking between earl and baron, and first bestowed (1440) by Henry VI. on John Beaumont. In Jersey it means an officer of the crown, like an English coroner.

Viscum, a genus of parasitic shrubs, belonging to the order Loranthaceæ. They grow on the branches of trees and live at their expense. They bear fascicles of flowers, diocious or monœcious. The common mistletoe is *V. album*.

Vishni-Volotchok. See VISHNII-VOLOCHOK.

Vishnu, the second person of the Trimurti, or trinity of Hinduism, is identical with the primeval essence which, before created things, moved on the face of the waters. He was first deified as the sun, whence, on taking his place among the Triad, he is described as the preserver of life. Four of his earliest alleged incarnations—a fish, a tortoise, a boar, and a man-lion—took place at a very remote period of the world's history. In four subsequent incarnations Vishnu took human shape, and is described as visiting the earth to do battle with evil or to avert disaster. It is as Râma and Krishna, sympathizing personal deities, that Vishnu appeals to the popular hearts and minds of Hindus. The ninth incarnation, Buddha, was without doubt added by Brahman theologians as a sop to weak-kneed Buddhists. A tenth in-

carnation, Hindus believe, is reserved for the last day, when Vishnu is to return to earth to execute righteousness and judgment.

Vishnupurana. See PURANAS.

Visible Speech, a method of representing speech sounds by means of alphabetic signs depicting the shape of the mouth in uttering them. Thus **O** represents the throat open, **0** contracted to a whisper. **I, I** are the stems of all vowels, and **C** = mouth contracted, and **E** = mouth divided, the stems of all consonants. **X** = the closed glottal catch. The ten radical symbols from which all vowels (20) and consonants (16) are formed are as follows:—

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
I	I	·	°	0	C	E	2		

Elements of 'Visible Speech.'

By this method deaf mutes have been taught to read, and difficult words in unknown languages pronounced. The system was first made known by A. M. Bell in 1867 through *Visible Speech; The Science of Universal Alphabetic, or Self-interpreting Physiological Letters for the Writing of all Languages in One Alphabet*. It was, however, preceded by *Principles of Speech* (1849), containing the germ of the idea, and the new system of letters was completed in 1864. See A. M. Bell's *English Visible Speech and its Typography Elucidated* (1904).

Visigoths. See GOTHs.

Vision. Upon the retina of the human eye rays of light proceeding from external objects are brought to a focus, and produce a miniature of the external scene similar to that thrown on the ground glass screen of a photographic camera. The media and dioptric mechanism by means

of which the rays of light are focussed on the retina are described in the article EYE. When the normal eye is at rest, parallel rays of light are brought to a focus on the retina, and all rays of light coming from six metres or beyond diverge so little that they may be regarded as parallel. From objects within that range, however, the rays diverge so much that the refractive power of the lens must be increased in order to bring them to a focus upon the retina. The power of accommodation is limited, and decreases with age, so that rays from objects brought too near the eye cannot be focussed, and blurred vision results. The range

of vision for distant objects is practically infinite, though the eyes of certain insects seem to be stimulated by rays invisible to man.

The duration of a stimulus necessary to produce sensation is exceedingly short; but once produced, the sensation persists as an after-image for a comparatively lengthy period. Distinct vision must be regarded as due to a division of the retina into sensational units. The differentiation of sensational units, however, is primarily determined by the cerebral centres, which receive the impulses from the retina. Singleness of vision with two eyes depends on the association of certain parts of each retina with the other. The ordinary movements of the eyeballs bring the visual axes of the eyes to converge upon an object, so that the two images fall on corresponding points. The associa-

tion of corresponding areas prevents the blind spot in each eye from being noticeable in ordinary vision. Binocular vision increases the facility with which size, distance, and solidity of objects are estimated, and its advantages are well illustrated by the stereoscope.

The discrimination of colour is most acute around the yellow spot. The colour of an object is due to its power of reflection or absorption of certain rays. Two theories, the Young-Helmholtz and the Hering, have been advanced to account for colour sensation and colour perception. According to the first, rays of different wave lengths initiate diverse molecular vibrations around the sensory nerve fibrils, which convey correspondingly varied impressions to the visual centres. According to the second, different rays produce diverse chemical changes, which in their turn stimulate the nerve fibrils in distinctive fashion. The chemical changes are assumed to be of a catabolic nature, and once initiated they persist for a time, so that an after-image results. A negative after-image follows when the reparative anabolic changes are renewing the sensitive material. See Foster's *Physiology* (1894), Landois and Stirling's *Physiology* (1891), Juler's *Ophthalmic Science and Practice* (1884), and Edridge-Green's *Hunterian Lectures on Colour Vision* (1911).

Vision, DEFECTS OF. The principal conditions which give rise to disordered vision will be readily understood if we keep in mind the three main factors involved in normal vision. These are: (1) the refracting media of the eye—the cornea, lens, and aqueous humour; (2) the receiving mechanism in the retina, optic nerve, and brain concerned in the reception and analysis of the light waves; (3) the state of the ocular muscles, which comprise

the external ocular muscles, by means of which both eyes are coordinated to act as one, and the internal ocular muscles, by means of which the eye is focussed for near or distant objects. Vision may be interfered with, therefore, in the first place by diseases of the refracting media; these may result from injury to the cornea, inflammation of the conjunctiva and cornea, disease of the lens (see CATARACT), and inflammation in the aqueous humour. In these conditions there is as a rule no disorder of the interior of the eye, and good vision is restored when the cause of the disorder has been removed. Hereditary defects in the refracting media of the eye producing disordered vision are dealt with in the article REFRACTION. The defects of vision which arise from disorder of the interior of the eye, of the optic nerve which conveys the stimuli to the brain, and of the special centres in the brain concerned in sight are of a more serious and often of a more permanent character. The retina and its adjacent covering, the choroid (see EYE), are subject to inflammation and degeneration, especially in adult and later life. These occur frequently in association with Bright's disease, diabetes, gout, and other disorders, and unless recognized and treated in their earlier stages are not amenable to treatment. The retina and optic nerves are in some subjects particularly susceptible to the action of poisons, and more especially nicotine, blindness from tobacco (tobacco amblyopia) being frequently met with. The removal of the cause is almost invariably followed by complete restoration of normal vision, although many months may elapse before the sight is fully restored. The optic nerve may be the seat of inflammation

or degeneration, arising from the presence of poisons in the blood or a tumour growth pressing on the nerve. In such cases the retina is speedily involved, giving the clinical picture of neuro-retinitis, recovery from which is rare. A primary degeneration or atrophy of the optic nerve is also met with, most commonly in locomotor ataxy (*tabes dorsalis*). In these cases the disease usually progresses until sight is all but entirely gone. Defects of vision due to central causes are not infrequent. These usually arise from the presence of a tumour, or abscess, or hemorrhage in the sight centres of the brain, which are located in the posterior part of the brain. In some cases, where the lesion is in one side of the brain only, the patient's vision may be restricted over one half of the field of vision only. To this state of half-blindness the term hemianopsia is applied. These forms of defective vision are usually of a serious and permanent nature. A less serious form of hemianopsia is met with in some cases of migraine; this is due to the action of chemical poisons on the sight centres. This is remedied by attention to the action of the liver and bowels, and by a careful regulation of the dietary. Reference must still be made to the defects of vision which arise from weakness or paralysis of the external ocular muscles, of which a familiar example is seen in strabismus or squint. There are six muscles concerned in the movements of the eye—the external rectus, turning the eye outwards; the internal rectus, inwards; the superior rectus, upwards; the inferior rectus, downwards; and the superior and inferior oblique muscles, turning the eye in an oblique direction. These various muscles are co-ordinated to act in concert, the external rectus of

one eye acting in concert with the internal rectus of the other eye when the eyes are directed to one side. When the muscles are all in order single vision is obtained, one object only being seen. But when there is weakness or paralysis of one or other of the muscles, as a result of which the corresponding eyeball is not moved in unison with the other, the impressions from the object looked at fall on different parts of the retina of the two eyes, with the result that double vision results. In some cases of squint it has to be noted that the patient may acquire the power of suppressing the images on one eye. In every instance the treatment has to be directed to the cause.

Visions. See SPIRITUALISM, PSYCHICAL RESEARCH.

Visit and Search. In time of peace piracy and the slave trade are the evils guarded against, and in time of war the use of neutral flags to cover merchant vessels of a belligerent, or the conveyance of contraband of war by neutral ships. The continental powers contend that neutral vessels under convoy are not liable to visit and search, but Great Britain has never formally accepted this doctrine. Neutral vessels of war are not subject to this right. On the occurrence of a visit the ship's papers—such as register, log, charter-party, etc.—must be produced. If these are found to be in order, the vessel is allowed to proceed upon her voyage; but if there is reason for suspicion, she may be subjected to a detailed search. If she resists the visit and search, or it appears that she or any part of her cargo is liable to seizure as a prize, she is detained and brought before a prize court of the capturing belligerent. Special rights of visit and search exist under the North Sea Fisheries Convention, for the purpose

of putting a stop to 'coopering,' or the illicit providing of spirits to fishing vessels in the North Sea.

Visitation, ORDER OF THE. See FRANCIS, ST., OF SALES.

Visitation of the Blessed Virgin Mary, a festival originating in France in the 13th century, commemorates the visit of Mary to Elisabeth. The Council of Basel in 1441 enjoined its observance. It was admitted to the York Calendar in 1526. It appears in the English Church almanac at the date July 2.

Visitor. All corporations are said to be subject to visitation. Ecclesiastical corporations are visited by the canonical superior—i.e. the crown visits the archbishop, the archbishop the bishops, and so on; but the only ecclesiastical visitation now practised is that of the parishes by the archdeacon. The only visitor of a civil corporation is the crown, which visits through the medium of the Court of King's Bench. In eleemosynary corporations—e.g. colleges at Oxford and Cambridge—the visitor is the founder, his heirs or appointees, or in default the crown. By the Endowed Schools Act, 1869, the Charity Commissioners may transfer (except in the case of cathedral schools) the right of visitation to the crown, to be exercised through them. The judges are visitors of the Inns of Court. The visitor is the final court of appeal on all matters affecting the body of which he is visitor.

Visnea, a genus of evergreen trees belonging to the order Ternstroemiaceae. The only species, *V. mocanera*, is a native of the Canary Is. It bears small flowers, which are succeeded by indehiscent berries, supposed by Linnaeus to have been the mocan, the syrup of which was employed by the aboriginal inhabitants of the Canary Is.

Viso, MONTE, the culminating point of the Cottian Alps (12,609 ft.), is a fine rocky pyramid, that rises (just in Italy) at the head of the valley of the Po. It was scaled in 1861 by W. Mathews and F. W. Jacobm.

Viso del Alcor, tn., Spain, in prov. of and 14 m. E. of Seville; has a mineral spring. Pop. 5,100.

Vison. See MINK.

Visp, or VISPACH, picturesque vil., Switzerland, canton Valais, in the Rhone valley, 6 m. w.s.w. of Brieg. Pop. 1,000.

Vissefjärda, comm., Sweden, gov. of and 31 m. w.s.w. of Kalmar. Pop. (1911) 5,615.

Vistula (Ger. *Weichsel*), riv. of central Europe, rises in the Carpathians, and flows N., describing a curve to the E., then another to the W. It divides Silesia from Galicia, and Galicia from Russian Poland, traverses or separates the Polish-Russian provinces of Radom, Lublin, Siedlee, Warsaw, and Plock, and leaves Russian territory above Thorn. It enters the Baltic lagoon of the Frisches Haff. Its principal tributaries are the San, Wieprz, Bug, and Drewenz. Length, 650 m.; its basin has an area of 73,400 sq. m. It becomes navigable at Cracow.

Vit, VINCENZO DE (1811-92), Italian scholar, born at Padua, became a canon and afterwards librarian of Rovigo, attaching himself to the brotherhood of Rosmini. He was the author of works on philology, history, and archæology, his best-known publication being the *Onomasticon*, a treatise on proper names (to the letter O) from the earliest times to the 5th century. He edited (with a supplemental volume) Forcellini's *Lexicon Totius Latinitatis* (1858-79).

Vita, tn., Sicily, in prov. of Trapani, 35 m. s.w. of Palermo. Pop. 6,000.

Vitalis, ORDERICUS. See ORDERICUS VITALIS.

Vital Statistics. The term vital statistics may be applied either to the method of gathering, tabulating, and analyzing the data or to the groups of tables and collected facts themselves. As a method, vital statistics reaches its greatest refinement in the mathematical theory used in the calculation of those tables of mortality and of expectation of life which have become the practical basis of scientific life insurance. As tabulations of numerical facts, vital statistics include primarily data of births, deaths, and marriages, and the numerous correlations of each of these. Among these correlations are the variations of births, deaths, and marriages according to seasons, climatic and geographical conditions, race, religion, occupation, density of population, and prices of food; the variations of births according to sex, the ages and occupations of parents, hour of the day, legitimacy, and residence in city or country; variations of deaths according to age, sex, conjugal condition, and diseases; and variations of marriages according to age and previous conjugal condition.

Of fundamental importance are complete and accurate registrations of births, deaths, and marriages, with a statement of the age, sex, conjugal condition, occupation, and cause of death. Registration of births, deaths, marriages, and divorces is carried on with great accuracy and completeness in a number of European countries and in the Australian commonwealth. In the United States the system of registration is for the most part of recent development, and is still far from complete, applying in 1910 to only about three-fifths of the total population.

The historical development of vital statistics may be said to have begun with the *Natural*

and Political Annotations upon the Bills of Mortality, by Captain John Graunt, F.R.S., in 1662. Graunt studied the proportion of the sexes in the total population; the ratio of the sexes at birth; the ratio of births to deaths in city and in country; the constancy in the proportion of deaths due to various causes 'to the whole number of burials;' and the proportion of persons dying at various ages. This last was little more than a rational guess. Graunt's work was soon followed in the same field by that of Petty, Gregory King, and Arbuthnot, and in 1693 appeared Edmund Halley's work, *An Estimate of the Degrees of Mortality of Mankind*, giving a table of mortality calculated on the assumption of a stationary population. The next great advance was made by the masterly work of Johann Peter Süßmilch, *Die Göttliche Ordnung, or The Divine Order in the Variations of Human Sex*, appearing in 1741. Süßmilch found an equality in the numbers of the sexes at the age of marriage; a ratio of 21 male to 20 female births; a ratio of 13 births to 10 deaths; and regularity in the number of deaths each year with respect both to sex and to age. About the same time attention began to be given to the calculation of the proportions dying at each age, and to the application of more refined mathematics to the whole problem of mortality and expectation of life. This work was carried on by Kersseboom in Holland, Deparcieux in France, and Wargentin in Sweden. The scientific basis of life insurance was laid in England by the Northampton table of Price and the Carlisle table of Milne, and the same work was accomplished for Belgium by L. A. J. Quetelet. This last-named statistician, by the abundance of his observations and the candour

and exactness of his methods, not only gave certainty to many of the conclusions of vital statistics, but animated the whole subject with the breath of modern science. Recent years have seen a great increase in statistical material, and a consequent rise in the degree of probability to be attached to the statistical conclusions.

Births.—There are two bases for calculating the birth rate—namely, the total population and the number of women of child-bearing age; the latter method may be extended to show the legitimate fertility or proportion of legitimate births to married women of child-bearing ages and the corresponding illegitimate fertility. Averages based on observations covering a series of recent years show the following number of legitimate children to be born alive to every 1,000 women of ages 15 to 45 years in the countries indicated: Netherlands, 315; Ireland, 289; German Empire, 284; Austria, 284; Scotland, 272; Italy, 269; Spain, 259; Belgium, 251; England and Wales, 236; Australian Commonwealth, 236; and France, 158. The corresponding figures for unmarried and widowed women ranged from 40 in Austria and 27 in the German Empire to 9 in England and Wales, 7 in the Netherlands, and 4 in Ireland. Investigations covering many years and many countries show that from 104 to 106 boys are born to every 100 girls. Female births tend to predominate in cities. The maximum of births is found to occur in February, and the minimum in June or July.

Marriages.—Marriage rates may be based on the total population or on the marriageable population, and may give either the number of marriages or the number of persons married. Recent observations show that the number of persons married to every

1,000 unmarried and widowed persons aged 15 years and upwards was: 73 in Hungary, 55 in the German Empire, 50 in Belgium, 49 in Austria, in Italy, and in England and Wales, 48 in France, 46 in the Netherlands, 42 in the Australian Commonwealth and in Switzerland, 40 in Scotland, 35 in Sweden, and 23 in Ireland. The marriage rate is usually higher in cities than in the country, owing to the migration of young marriageable persons from rural to urban areas. The average age of marriage varies with the occupation.

Deaths.—The mean annual death-rates per 1,000 of the population in the decennium 1901-10 were as follows: Roumania, 25·8; Hungary, 25·7; Spain, 25·2; Austria, 23·3; Italy, 21·5; France, 19·4; German Empire (1901-9), 19·0; Finland, 18·0; Ireland, 17·4; Switzerland (1901-9), 16·9; Scotland, 16·6; Belgium (1901-9), 16·6; England and Wales, 15·3; the Netherlands, 15·2; Sweden, 14·9; Denmark, 14·2; Norway, 14·2; and the Australian Commonwealth, 11·2. In the registration area of the United States the general death-rate (1901-10) was equal to 15·6 per 1,000, and was considerably higher for both sexes of the coloured population than that of the white population.

For statistics relating to the total estimated population in each of the principal countries, and of births, deaths, and marriages in each country, see the official annual 'Statistical Abstracts' for the United Kingdom, for the British possessions, and for foreign countries; also the carefully-compiled figures for each country in the *Statesman's Year-Book* (annual); the Annual Summaries and Annual Reports of the Registrar-General of England and Wales; Newsholme's *Vital Statistics* (1899); *Statistique internationale du mouvement de la population d'après les registres*

d'état civil (1907; published by the French government).

Vitebsk. (1.) Government, Central Russia, with Courland on s.w.; area, 17,440 sq. m. The surface is an undulating plain, which belongs to the basins of Lakes Peipus (Chudskoe) and Ilmen, and the W. Dwina. Lakes and marshes are numerous, the latter being very extensive. The chief crops are oats and rye; then come potatoes and flax. Orchards and nurseries are fairly prosperous. Domestic industries are mainly concerned with timber. The greater industrial establishments include paper, saw, and flour mills, tanneries, distilleries, and tobacco manufactories. Of the population 63 per cent. are Russians and Orthodox (mostly White Russians); 23 per cent. Letts, Poles, and Catholics; 10 per cent. Jews. Vitebsk formed a separate principality from the 11th to the 13th century; in the 14th century it was conquered by Lithuania. Pop. 1,820,000. (2.) Town, Central Russia, cap. of Vitebsk gov., on W. Dwina (Düna), 80 m. w.n.w. of Smolensk. It is a river port and episcopal see, with a cathedral. It has dye works, and manufactures candles, vinegar, mineral waters, tobacco, varnish, and woollen and linen cloth. Pop. 82,000, largely Jews.

Vitellius, AULUS (15-69 A.D.), emperor of Rome from Jan. 3 to Dec. 20, 69 A.D., was consul in 48 A.D., and afterwards proconsul of Africa for one year. Galba gave him the command of the troops in Lower Germany in 68 A.D. He was soon persuaded by Valens to aim at the throne, and Valens and Cæcina defeated his rival Otho at the first battle of Bedriacum (April 69). Vitellius reached Rome in July; but at the same time Vespasian was proclaimed emperor in the East. In October his troops defeated the Vitellians in the second battle

of Bedriacum, and marching on Rome killed Vitellius. See Henderson's *Civil War and Rebellion in the Roman Empire* (1908).

Viterbo, tn., Rome prov., Latium, Italy, 40 m. N.N.W. of Rome; has manufactures of soap, paper, leather, and matches. It is surrounded by ancient Lombard fortifications, and near it are Etruscan cemeteries. Pop. 21,500.

Vitet, LUDOVIC (1802-73), French writer and politician, born in Paris; was appointed by Guizot inspector-general of monuments (1830). He became secretary to the minister of commerce and a deputy (1834), and a councillor of state (1836). In 1845 he succeeded Soumet as a member of the Academy. The *coup d'état* (Dec. 2, 1851) compelled him to retire into private life. His works include *Histoire des Anciennes Villes de France* (1833), *Histoire de Dieppe* (1838), and *Les Etats d'Orléans* (1849).

Vitex, a genus of trees and shrubs belonging to the order Verbenaceæ. They bear cymes of white, blue, or yellow flowers, the corollas being more or less bilabiate. The tree of chastity, or monk's pepper tree (*V. Agnus castus*), is hardy in the milder and more sheltered parts of Britain.

Viti. See FIJI.

Vitis, a genus of mostly climbing shrubs, belonging to the order Ampelidaceæ. They bear small flowers, followed by ovoid or globose berries. The best known species is *V. vinifera*, the grape vine. (See VINE.) Other varieties are *V. apitifolia* (parsley-leaved vine), with delicately and deeply-cut foliage; and *V. purpurea*, with its leaves coloured deep purple all through the summer and autumn. A vine which has been grown in English gardens since the middle of the 17th century is the North American *V. aestivalis*, or summer grape; in some autumns it takes

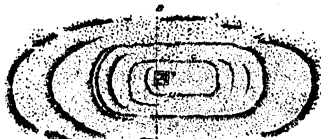
on a brilliant red colour. Another old species introduced into Britain two hundred years ago is the tree vine (*V. arborea*), with beautiful, deeply-divided foliage. One of the best and most vigorous of the American species is the northern fox grape (*V. labrusca*), the leaves of which, however, usually fail to colour in autumn. Of the true Asiatic vines—apart from the varieties of *V. vinifera*—the one most frequently grown in England is probably the hop-leaved vine, which possesses delightful foliage. But supreme among the decorative vines is the vigorous, large-leaved Japanese species, *V. Cointea*, which in its native home clambers over the tops of the tallest trees, and in autumn assumes every shade of crimson, orange, rose, yellow, and scarlet. Many of the vines, in particular *V. riparia*, a hardy American kind, yield a delicious fragrance.

Vitoria, or VITTORIA, cap. of Basque prov. of Alava, Spain, 31 m. S.E. of Bilbao; has manufactures of mirrors, paper, carriages, hardware, and picture frames. The cathedral dates from the 12th century. On June 21, 1813, Wellington defeated here the French under Joseph Bonaparte and Jourdain. Pop. (1910) 32,377.

Vitré, tn., dep. Ille-et-Vilaine, France, on l. bk. of Vilaine, 24 m. by rail E. of Rennes; has hosiery factories, iron foundries, and black stone quarries. The town has a quaint Breton appearance, and has a 14th-century castle. Pop. 10,000.

Vitrified Forts, camps or forts (crowning the summits of hills in certain parts of Central and Western Europe, including the British Isles) whose ramparts of rough, undressed stones are found to have been 'compacted together by the force of fire, and that so effectually that most of

the stones have been melted down.' Thus wrote John Williams in 1777. But portions of the ramparts consist solely of loose stones that have resisted the effort to fuse them together. It has been argued from this that the vitrified portions are merely the result of accident, the effect of blazing watchfires on the walls. The earliest theory was that the peculiar character of the vitrified forts was due to volcanic action, and that the hilltops thus fortified were extinct craters; but this position was speedily abandoned. The 'accidental' theory, however, finds much justification in the fact that, even in good specimens of this kind of fort, there are lacunæ of unvitrified wall; and it is difficult to see why the builders should designedly consolidate some parts of the wall and not the whole of it. On the other hand, the fort at Carradale, near Campbelltown, Scotland, seems clearly to indicate design on the part of the builders. An ingenious surmise, offered by Lady Ferguson in her *Story of the Irish before the Conquest*, is that a certain 'glass castle' of Irish tradition 'may possibly have been a vitrified fort.' As to the period in which these structures were reared there is abundant room for conjecture. But as the fort at Peran in Brittany was found to have 'a fragment of a Roman roofing-tile firmly attached to the melted stones of the vitrified wall,' it is evident that that particular fort does not antedate the Roman occupation of Brittany, and not unlikely it was built after the Roman houses were in ruins. See John Williams's *On Highland Ruins* (1777); papers by Dr. John Stuart and Dr. Ferdinand Keller of Zürich, in the *Proceedings of the Society of Antiquaries of Scotland*, vol. viii.; Dr. Angus Smith's *Loch Etive and the Sons of Uisnach* (1879); and



Plan of Forts
Dunnidear,
Aberdeenshire



Section of Dunnidear
as on plan



A pile of

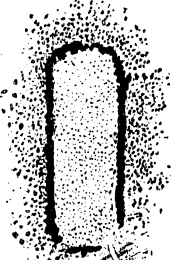
Vitrified Wall



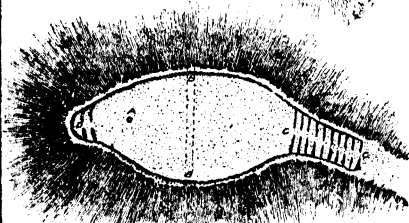
Tower, Dunnidear



Pleschitz
near Aigels,
Vitrified Ramparts
in Bohemia



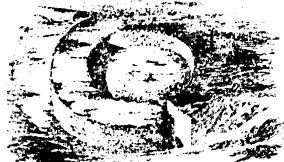
Plan of
Tap o' Noath



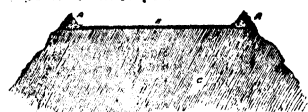
Plan of
Knockferrel near Dingwall



Section of
Tap o' Noath
Aberdeenshire



Circular walls of Laws, Forfarshire



Section of Knockferrel
Two miles west of Dingwall
in Ross-shire
as on plan

Examples of Vitrified Forts.

Dr. Robert Munro's Prehistoric Scotland (1899).

Vitrina, or GLASS-SNAIL, a genus of pulmonate gastropods, in which the shell is thin, depressed, and small, so that it is incapable of lodging the whole of the animal's body. Some of the species are carnivorous. In Britain there occurs *V. pellucida*.

Vitringa, CAMPEGIUS (1659-1722), Dutch Orientalist and theologian, born at Leeuwarden; was the most distinguished pupil of Cocceius, and became professor of Oriental languages (1681), then of theology (1683), at Franeker. His works include *Commentaries* (6 vols. 1383-1708), *De Synagoga Vetere* (1696), *Typus Theologiæ Practicæ* (1716), and *Isaian* (1714-20).

Vitriol. Certain metal sulphates are commonly loosely described as vitriols—e.g. copper sulphate, blue vitriol; iron sulphate, green vitriol; zinc sulphate, white vitriol. See SULPHURIC ACID.

Vitro-Varnish Painting, an art almost lost, but apparently practised in Venice in the 15th century. Take varnish highly coloured for painting, and mix with it from 5 to 10 per cent. of burnt-glass powder. This forms a paint, which is applied with a finely-pointed brush, as in gesso-painting. The effect when dry is that of glass in relief, and it can be raised to any height by applying successive coats. The same effect is produced by painting with water-glass, a solution of sodium. Vitro-varnish painting can be applied to any surface.

Vitruvius, whose full name was MARCUS VITRUVIUS POLLIO, author of a treatise on architecture, *De Architectura*. He lived in the reign of Augustus; was a military engineer, and served in Africa. He treats of architecture, of water and aqueducts, of sundials, and of machines. It is

largely based on Greek authorities. Editions by Schneider (1807), Rose, and Müller-Strübing (1867); Eng. trans. by Gwilt (ed. 1860) and Wilkins (1812).

Vitry-le-François, fort. tn., dep. Marne, France, on the Marne, 103 m. E. of Paris, at the junction of the Marne-Rhine and Haute-Marne canals; has manufactures of cement, mosaics, and iron founding, and trade in wine and grain. De Moivre the mathematician was a native. Pop. (comm.) 8,400.

Vitry-sur-Seine, comm., France, in Seine dep., 4 m. S.S.E. of Notre-Dame, Paris. Pop. 11,500.

Vittoria, tn., Sicily, in prov. of and 45 m. W. by S. of Syracuse; has a trade in ashes, soda, and wine. Pop. 32,000.

Vittoria, COLONNA. See COLONNA.

Vittorio, tn., prov. Treviso, Italy, 40 m. N. of Venice; has mineral springs, silk mills, and manufactures cement. Vittorio was formed in 1879 by the union of the two rival towns of Ceneda and Serravalle. It is the seat of a bishopric. Pop. 19,000.

Vittorio Emanuele. See VICTOR EMMANUEL.

Vitus, a Roman saint martyred under Diocletian. His day is June 15. His influence is besought against such diseases as St. Vitus's dance, sudden death, and hydrophobia. He is the patron of dancers.

Vivandière, a woman attached to the French armies who is permitted to sell provisions to the troops. She generally used to wear a dress adapted from the uniform of the regiment to which she was attached. The male vendor has mostly taken her place.

Vivarini, a family of Italian painters, originating in the island of Murano, at Venice. The principal members were—LUIGI

or **ALVISE**, who lived in Venice (1464 - 1503); **ANTONIO** (called Antonio da Murano), died c. 1470; **BARTOLOMMEO** (1449-99), the first of the Venetian school to receive from Antonello of Messina the art of painting in oils.

Vivero, seapt., Spain, in prov. of and 43 m. N. of Lugo, on the Bay of Biscay. Pop. 12,800.

Viverra. See **CIVET**.

Vives, **JUAN LUIS**, more generally **LUDOVICUS VIVES** (1492-1540), Spanish writer and Latinist, born at Valencia; was considered the most learned man of his time, and became tutor to the children of Ferdinand and Isabella. He was a friend of Sir Thomas More and of Erasmus, and was brought (1523) to England by Wolsey to become reader of rhetoric at Corpus Christi College, Oxford. His works were translated by Sir R. Moryson, in *Introduction to Wysdome from Vives* (1540); and the *Instruction of a Christian Woman*, a most popular book, was translated by Richard Hyrde; whilst Thomas Paynel translated *The Office and Duty of a Husband* (1550).

Vivien, **MERLIN AND**. See **IDYLLS OF THE KING**.

Vivien de Saint - Martin, **LOUIS** (1802-97), French geographer, born at Caen in Normandy; became a cartographer, and published *Carte Electorale* (1827), *Tables Chronologiques* (1827), and *Géographie de France* (1832). He also translated the works of Sir Walter Scott (1836-9), and wrote *Histoire de la Révolution Française* (1840-2), and *Histoire de Napoléon* (1843). But his two greatest achievements are his *Nouveau Dictionnaire de Géographie Universelle* (1879-95), and an *Atlas Universel* to illustrate his *Histoire de la Géographie* (1874).

Vivisection, or the dissection of the living subject, was practised upon human beings by Herophilus (300 B.C.), and down to

1570 criminals were vivisectioned at Pisa. Although in some French veterinary schools operations are still performed on lower animals in order to promote manual dexterity, vivisection now implies, not dissection in the ordinary sense, but the performance of an operative experiment upon a living animal for the purpose of advancing biological science. In Britain, experiments which inflict pain upon animals may be undertaken only by those teachers and investigators who have obtained a government licence, and vivisectioners themselves agree that the experimenter must be a skilled anatomist and physiologist, that anæsthetics should be used to the utmost possible extent, and that mere repetitions of experiments whose object has been attained are unjustifiable. The word experiment covers the use of only one animal, and whenever suppuration follows the operation, the animal is destroyed painlessly. Such operations embrace the establishment of fistulæ, the section of nerves, the removal of secretory glands, and like measures, and the experiment in such cases is incomplete without observation of the after-effects. But the after-effects would be vitiated were the animal suffering pain, or were its tissues septic. For many years there has been an anti-vivisection agitation, which has tended to keep the practice within limits and prevent abuses. A royal commission was appointed in September 1906 to inquire into the whole subject, but their report has not yet (1912) appeared.

Vivonne, **CATHERINE DE**. See **RAMBOUILLET**.

Vizagapatam, seapt., munic. tn., and cap. of Vizagapatam dist., Madras Presidency, India, 178 m. N.E. of Masulipatam. Exports grain, manganese ore, and

sugar, manufactures native cloth, and has ivory, horn, and sandalwood carving. It has a college. Pop. 40,000. The district has an area of 17,220 sq. m., and a population of 3,000,000. Its chief crops are cotton, rice, millet, oil seeds, sugar, and tobacco.

Vizcaya, or **BISCAY**, Basque province of Spain, an entirely mountainous district on Bay of Biscay; largely engaged in iron-mining and ore export. Area, 836 sq. m.; pop. (1910) 348,684. Capital, Bilbao.

Vizetelly, **HENRY** (1820-94), English illustrated press pioneer, born in London; successfully started the *Pictorial Times* (1843) and the *Illustrated Times* (1855). He became Paris correspondent of the *Illustrated London News* (1865), remaining there during the siege, and afterwards publishing *Paris in Peril* (1882). *The Man with the Iron Mask* (1870) was followed by several manuals on wine, *Berlin under the New Empire* (1879) and an edition of *Memoirs of Grammont* (1889). Vizetelly had now started publishing, particularizing in translations from French and Russian. He was fined for publishing obscene libels (1888), and a year later was imprisoned for the same offence. His last work was *Flances Back through Seventy Years* (1893).

Vizeu, or **VISEU**, tn., Portugal, in Beira, 42 m. N.N.E. of Coimbra. It is notable for its fine old cathedral, which is said to contain the tomb of Roderick, the last king of the Visigoths. Pop. 8,200.

Vizianagram, tn., Vizagapatam dist., Madras Presidency, India, 30 m. N. by E. of Vizagapatam. It is a military cantonment and the residence of the maharajah. Pop. 37,500.

Vizier, the chief political officer of the early caliphs (750); adopted

(1328) by the Ottomans, and assigned to the highest official at the Mogul court of Delhi and in other Mohammedan states, Grand Vizier, president of the divan, or council of ministers, was abolished (1878) by treaty of Berlin.

Vizille, comm., France, in Isère dep., on the Romanche, 8 m. s. by E. of Grenoble. In its fine park is a statue commemorating the assembly here of Dauphiné deputies on July 21, 1788, which is regarded as the prelude of the French Revolution. Pop. 4,300.

Vizzini, tn., Sicily, in prov. of and 30 m. s.w. of Catania. Pop. 17,800.

Vlaardingen, fishing-port of Netherlands, prov. S. Holland, near r. bk. of Maas, 6 m. by rail w. of Rotterdam, one of the headquarters of the Dutch cod and herring fisheries. Pop. (1910) 21,885.

Vladikavkaz, fort. tn., cap. of Terek prov., Russian Caucasus, 90 m. N. of Tiflis, and on river Terek, where it occupies a position of great strategic importance. Pop. 70,000.

Vladimir. (1.) Government, Central Russia, lying between Nijni-Novgorod on E. and Moscow on W. Area, 18,864 sq. m. The surface is a rolling plain, which belongs entirely to the Volga basin, mainly through the Oka and Klyazma. Lakes and marshes are numerous, the latter extensive. The chief mineral deposits are alabaster, limonite, and porcelain clay. The soil is for the most part sandy, stony, and clayey. The crops are rye, oats, millet, barley, potatoes, and flax. Fruit-culture is very flourishing. Industrially, Vladimir is the third government in Russia (coming after Moscow and St. Petersburg). The industries are concerned chiefly with the working of cotton, flax, cloth, silk, glass, pottery, crystal, metals

(especially copper and iron), chemical products, timber, hides, icon painting, house painting, the manufacture of carts and carriages, gloves and stockings, beer and spirits, matches, and fur garments. Of the population, over 95 per cent. are Great Russian and Orthodox. Pop. 1,875,000. (2.) Town, Central Russia, cap. of Vladimir gov., 105 m. E.N.E. of Moscow; an archiepiscopal see (Vladimir-Suzdal). It is a river port, and has dye works, cotton mills, manufactures of candles, malt, and tobacco; also gardening and fruit raising, especially cherries. Founded in 1116 by Vladimir Monomakh, Vladimir became the capital of a line of grand princes, who replaced those of Kiev in power among Russian rulers. Pop. 32,000.

Vladimir Volhynskiy, tn., Russia, in gov. of Volhynia, 28 m. s.s.w. of Kovel. It is an old 9th-century town. Pop. 10,000.

Vladivostok (originally called PORT MAY), fort. seapt. tn., cap. (since 1903) of the viceroyalty of E. Asia, Siberia, chief Russian naval port on Pacific, and a terminus of the Trans-siberian railway, is situated on E. shore of Amur Gulf. Its harbour of the Golden Horn is one of the most beautiful in the world. The climate is severe, the mean temperature for January being 6° F., while for August it is 70°. Its chief imports in 1909 were tea (£614,152), salt, rice and other cereals, live-stock and meat, machinery, and cotton goods. Its exports included soya beans (£869,116), bean and other cakes, and fish. Pop. 90,000 (one-third Chinese). In the Russo-Japanese war it escaped attack by the Japanese, but suffered from naval mutiny and unrest in the Russian disturbances of 1905-6.

Vlagentwedde, comm., Netherlands, prov. of and 26 m. S.E. of Groningen. Pop. (1910) 8,257.

Vilssingen. See FLUSHING.

Vodena, tn., Monastir vilayet, Turkey in Europe, 40 m. E.S.E. of Monastir; has manufactures of tobacco, cotton, and leather. It is the see of a Greek archbishop. Here Philip II. of Macedon was assassinated. Pop. 14,000.

Vodka, Russian brandy, is a harsh, noxious, strong, fiery spirit, prepared mainly from rye, but also obtained from barley, oats, and rye mixed.

Voetius, or VOET, GISEBERT (1588-1676), Dutch theologian, born at Heusden; became professor of theology at Utrecht (1634). He opposed the Arminian party at the Synod of Dort, and was an opponent of Descartes. His principal work is *Selecte Disputationes Theologicae* (5 vols. 1648). See *Gisbertus Voetius*, by A. C. Duker (1893-1904).

Vogel, SIR JULIUS (1835-99), New Zealand statesman, was born in London, and was editor of the *Maryborough and Dunally Advertiser*, Australia; afterwards started the first daily paper in New Zealand, the *Otago Daily Times*. He became the head of the provincial government in 1866; colonial treasurer in 1869; postmaster-general of New Zealand, 1870. In 1871 he established the mail service between New Zealand and San Francisco. In 1872 he was again in office, and was premier in 1873. He was made K.C.M.G. in 1875. From 1876 to 1880 he was agent-general for New Zealand in London, and in 1884-7 he was head of a coalition ministry in New Zealand.

Voghera, tn., Pavia prov., Lombardy, N. Italy, 16 m. by rail S.S.W. of Pavia; has manufacture of silk. Pop. 21,000.

Vogler, GEORGE JOSEPH (1749-1814), German musical composer, was born at Würzburg; ordained priest at Rome (1773); founded schools of music at Mannheim, Stockholm, and Darmstadt; and

numbered Meyerbeer and Weber among his pupils. His name is only known to many by Browning's poem, *Abt Vogler*. See *Life*, in German, by Schaffhütl (1887).

Vogt, CARL (1817-95), German biologist, born at Giessen; studied under Liebig and Valentin; and was the friend and collaborator of Agassiz and of Desor. Professor at Giessen (1847), he lost his chair through supporting the revolution (1848). Deputy for Giessen, he was expelled from Germany for his political views, and resided at Bern until called (1852) to the chair of comparative anatomy and zoology at Geneva. He was an active and thoroughgoing Darwinist. His works include *Physiologische Briefe* (1845); *Untersuchungen über Tierstaaten* (1851); *Bilder aus dem Tierleben* (1852); *Vorlesungen über den Menschen* (1864); and *Altes und Neues aus dem Tier- und Menschenleben* (1859). See B. Weber's *Professor Karl Vogt* (1899).

Vogüé, CHARLES JEAN MELCHIOR, MARQUIS DE (1829), French archaeologist and diplomatist, born in Paris; explored Palestine and Syria (1853-4), and became member of the Academy of Inscriptions (1868). In 1871 he was appointed ambassador at Constantinople, from which he was promoted to Madrid in 1873, but resigned in 1879. He was elected a member of the French Academy in 1901. His works include *Les Eglises de la Terre Sainte* (1860), *Le Temple de Jérusalem* (1865), *Mémoires de Villars* (1889), and *Le Duc de Bourgogne et le Duc de Beau-Villiers* (1900).

Vogüé, EUGÈNE MELCHIOR, VICOMTE DE (1848-1910), French historian, cousin of above, born at Nice; contributed to the *Revue des Deux Mondes* and the *Journal des Débats*. He was a member of the French Academy from 1888, and was deputy for Ardèche (1893-8). His chief work is *Le*

Roman Russe (1886); but he also wrote *Histoires Orientales* (1879), *Chez les Pharaons* (1879), *Histoire et Poésie* (1898), *Jean d'Agrève* (1898), *Les Morts qui Parlent* (1899), *Le Maître de la Mer* (1903), and some ten volumes of literary and historical articles.

Vohwinkel, vil. of Rhenish Prussia, in dist. of Düsseldorf, 4 m. E.S.E. of Mettmann. Pop. (1910) 14,730.

Voice and Voice Training.

Voice is sound generated in the larynx. Generally speaking, the smaller the size of the larynx, the higher the pitch of the voice, and *vice versa*. From the age of six until nearing the period of puberty the larynx is approximately similar in size in both sexes; but in adults the larynx is about a third larger in males than it is in females, and the male voice is generally an octave lower in pitch than the female. Six species of singing voice are now recognized—viz. bass, baritone, tenor (male); contralto, mezzo-soprano, and soprano (female). The classification of voices is determined by the nature of their timbre, and not by their extent of compass. In each species the average compass ranges from a little under to a little over two octaves, a compass of three octaves being exceptional. The lowest musical sound known to be capable of production by the human voice is the note G below the bass stave, the highest is B in *altissimo*. A series of notes of approximately similar quality is termed a 'register.' At the junction of certain registers an indefinite number of notes may be produced either as higher notes of the lower, or as lower notes of the higher register, and the change of register should always be made upon one of these 'optional' tones. When the change of register is only barely perceptible, the registers are said

to be perfectly 'united' or 'blended.' The familiar terms 'chest-voice' and 'head-voice' date from the period when it was not known that all voice originates in the larynx. Apart from the influence of 'registers,' the sounds produced by an individual voice vary in volume and quality according to the strength of the air current which causes the vocal ligaments to vibrate, and the extent to which the tone is reinforced or modified in or by the resonating chambers of chest, throat, mouth, and nose.

The first essential to correct voice production is proper management of the breath. The method of breathing taught in the early Italian schools of singing was that now known as 'inferior costal,' in which the abdomen is drawn slightly inwards, and the chest is raised during inspiration. In France and Britain at the present day, the greater number of celebrated vocalists also use inferior costal and diaphragmatic respiration, and many keep the chest in a fixed high position both in inspiration and in expiration. All voice should be produced with the least possible expenditure of breath. Inspiration should be made through the nose, unless for quick 'half-breaths,' and respiration should be so regulated that the lungs neither become overcrowded with air nor exhausted to a degree which does not leave a conscious reserve of breath at the conclusion of a sustained tone.

The voice is said to be correctly 'placed' when it is directed towards the frontal portion of the roof of the mouth, and a sense of strong vibration is felt in the bridge of the nose. Each tone, whether loud or soft, must be 'attacked' with decision, but not in an 'explosive' manner, and any tendency to 'scoop' up to the notes must be instantly checked. See Morell Macken-

zie's *The Hygiene of the Vocal Organs* (5th ed. 1888); Brown and Behnke's *Voice, Song, and Speech* (15th ed. 1893); Curtis's *Voice Building and Tone Placing* (2nd ed. 1900); Sims Reeves's *The Art of Singing* (1900); Ellis's *Speech in Song* (1878); Newland's *Voice Production* (1906); Lunn's *Philosophy of Voice* (10th ed. 1906).

Void and Voidable. A transaction is void if it has no legal effect—e.g. a contract to commit a crime. It is voidable if it can be rendered void by putting the law in motion: for example, a contract is voidable on the ground of misrepresentation, though a party aggrieved may elect to abide by and sue on it.

Voiron, tn., dep. Isère, France, 14 m. N.N.W. of Grenoble; has manufactures of cloth, silk, and paper. Pop. 12,000.

Voiture, VINCENT (1598-1648), French writer of *vers de société* and of letters—tittle-tattle of the Hôtel Rambouillet—where he was introduced in 1625. Born at Amiens, he won favour with Gaston d'Orléans by tactful flattery in verse (1614), and with Richelieu in prose (1636); was made *maître d'hôtel* (1638) by Louis XIII.; and pensioned by D'Avaux (1642), Anne of Austria (1643), and Mazarin (1645). By turns literary *précieux*, wit, courtier, diplomatist, duellist, gambler, squire of dames, he was an original member of the Academy. His works were first published in 1650. Later editions: *Poems*, by Ubicini (1855), and Roux (1856); *Letters*, by Uzanne (1880). See also Sainte-Beuve's *Causeries du Lundi*.

Volans, a southern constellation, south of Argo, introduced at the end of the 16th century. It contains no star above the fourth magnitude. γ , ϵ , ζ are double.

Volapük, an artificial language, invented in 1879 by Schleyer of Constance, Baden, for

international use. He taught it successfully in Paris in 1886, and in 1887 it was advocated for diplomatic and scientific purposes by the Philological Society of London. The roots are chiefly borrowed from Romanic, Germanic, and especially the English languages, shortened. The orthography is strictly phonetic. The leading peculiarities of Volapük are: (1) The alphabet consists of twenty-seven letters—eight vowels and nineteen consonants; (2) each letter has but one sound; (3) the consonants are sounded as in English, except *c* and *j*—*j* is always hard, and *h* is an aspirate; (4) the accent is invariably on the last syllable; (5) there is one conjugation, and there are no irregular verbs; (6) all word-forms and inflections are regular; (7) adjectives, verbs, and adverbs are regularly formed from substantives; (8) *w* becomes *r*, and *l* is substituted for *r*; (9) words are as far as possible reduced to one syllable; (10) nouns have one declension and four cases; (11) adjectives are formed by adding *ik* to the substantive, and adverbs by adding *o* to the adjective, as *fam* (glory), *famik* (glorious), and *famiko* (gloriously); (12) *oi* prefixed to a word indicates the feminine gender. In 1888 C. E. Sprague published *The International Language: Hand-book of Volapük*. Volapük has been to a large extent superseded by Esperanto. See ESPERANTO.

Volaterræ. See VOLTERRA.

Volcanoes are typically mountains of conical form, which discharge steam and other gases, ashes, and lava through a deep cup-shaped orifice or crater, situated near the summit. Vesuvius, near Naples, is the best known example. During violent eruptions the material which gathers in the crater is projected, and the depth of the crater is said to reach occasionally 2,000 ft. A

small central cone is often built up within the crater, and around it the steam and ashes are emitted. To the north of the crater rises the broken cone of Monte Somma, the remains of a larger volcano. The existing Vesuvius has been gradually piled up on the depressed edges of the great crater bowl of Monte Somma. In the Phlegrean Fields near Naples are many small volcanoes, extinct or in a quiescent state, and discharging only carbon dioxide and sulphurous gases. This is known as the solfataric condition, from one of these minor cones (the Solfatara). At Vesuvius, during normal conditions, only small quantities of steam, mixed with sulphurous gases and volcanic ashes and dust, are emitted. Greater activity is marked by the ascent of large gray steam clouds, which ascend vertically for several thousand feet, then spread out and flatten like the top of a pine tree. Larger blocks of lava, known as bombs, are ejected with the steam. After a longer or shorter duration of this phase the lava rises in the crater and wells out through some opening in its sides. The lavas are red hot at first, but rapidly cool, and then have a rough, slaggy crust, under which the liquid interior mass continues to advance. Great quantities of water are dissolved in the lavas, and enormous steam clouds mark their progress.

Vesuvius has been known as an active volcano since the year 79, when the great eruption took place in which the elder Pliny perished, and Pompeii, Herculaneum, and Stabiz were overwhelmed. Since then it has continued active, though with many periods of repose, sometimes lasting for several hundred years. The Lipari Is., off the N.E. of Sicily, contain many volcanoes. Of these Vulcano has had several eruptions in recent years, and Stromboli is in a state of almost constant ac-

tivity. Many islands have begun as submarine volcanoes, and have gradually been built up till they overtopped the sea surface.

For the more powerful manifestations of volcanic activity, however, we must pass to extra-European countries, such as Java, Japan, New Zealand, the West Indies, and the Sandwich Islands. Two main types of great eruptions may be distinguished—the explosive and the effusive. In the former the activity is very violent, but brief and intermittent. Usually these volcanoes rest for many years, then have an eruption which lasts a few weeks or a few days, and sink again into quiescence. Krakatoa is a good instance. It is an island in the Sunda Straits, between Java and Sumatra. In 1883, after two centuries of repose, it again became active. On the 26th August a gigantic explosion took place. One half of the adjacent island of Rakata was blown away, and the depth of the great submerged crater, on the edge of which Rakata stood, was increased to nearly 200 fathoms. The ashes were projected into the air to such a height that the finest of them were carried all over the world, and for months afterwards occasioned brilliant sunset effects in all latitudes. Great sea-waves, from 70 to 100 ft. high, started from the crater and devastated the surrounding coasts, drowning many thousands of people. The waves crossed the oceans in all directions, and were traced by their effects on the tide gauges even in California and the Isthmus of Panama. Waves were also produced in the atmosphere, and circled round the whole globe.

In 1886 a great explosive eruption suddenly took place in the North Island of New Zealand in the hot-springs districts around Lake Tarawera. The white and

pink terraces of Rotomahana were destroyed, and a fissure eleven miles long was opened, out of which steam and ashes proceeded. The eruption lasted only a few hours. The most deadly outbursts of this type are those of the West Indian volcanoes, Pelée in Martinique and La Soufrière in St. Vincent. In 1902, after a brief preliminary phase, they burst into activity, and discharged not only clouds of steam and ashes, but also black clouds or burning clouds, composed of superheated steam and incandescent dust. These rolled like torrents of water down the slopes of the mountains. About 2,000 people perished in St. Vincent, while in Martinique, the city of St. Pierre, with nearly 40,000 of its inhabitants, was destroyed in a few minutes.

The second type of volcanic activity, the effusive, is characterized by the emission of floods of lava, which deluge large tracts of country. The best examples are found in the Sandwich Islands, and are great cones rising to 12,000 ft. above sea-level. They are composed principally of black basaltic lava flows, while beds of ashes, indicating explosive volcanic action, are few or wanting. The principal crater is Kilauea, a great flat-bottomed pit 2 or 3 m. across, with vertical sides, rising from 700 to 900 ft. above the interior floor of lava. In the centre of this crater there is 'a lake of fire.' Certain also of the Icelandic volcanoes have discharged great lava-flows. In 1783 Skaptar Jökul emitted a flood of basalt, which has been estimated to have a mass equal to that of Mont Blanc. In one direction it extended for 50 m., and its breadth in places was from 12 to 15 m., its depth in some parts 800 ft. Enormous sheets of basalt belonging to the same system of volcanic centres are found in the north of Ireland (Giant's Cause-

way) and in the Inner Hebrides (Skye and Mull). Other fields of basalt of great extent occur in the Deccan (India) and on the Snake River (Idaho) and Columbia River (Washington).

The geographical distribution of active volcanoes is a subject of great interest. By far the greater number stand near the sea; this is probably due to the fact that many coast-lines are determined by earth-folds. A great ring of volcanoes encircles the Pacific. It includes the volcanoes of Kamchatka, the Kuriles, Japan, the Liu-Kiu Is., Philippines, Java, Sumatra, New Zealand, and the Antarctic (Erebus and Terror). It is continued in Patagonia and the Andes, Central America, Mexico, Western N. America (Cascade Mts., where there are many volcanoes, recently extinct), and Alaska. Branches of this great chain are found in the W. Indies, and in Sumatra and the islands of the Indian Ocean. Along the centre of the Atlantic there lies a ridge, capped with volcanic islets—e.g. Tristan d'Acunha, St. Helena, Ascension, the Cameroons, Cape Verde Is., Canary Is., and Azores. Nearer the Arctic are Iceland and Jan Mayen. In the Indian Ocean the principal volcanoes are those of Madagascar, Mauritius, Réunion, St. Paul I. A number of cones occur in Africa, including Kilima-Njaro and Kenia. They lie along a set of fissures, which pass northwards into the Red Sea, and thence into Syria and Palestine. Similarly the Alpine system of recent mountain folding, with its extensions into the Apennines, the Balkans, Carpathians, Caucasus, and Himalaya are accompanied in many districts by volcanoes, active or recently extinct. These include the Italian volcanoes already mentioned, the extinct cones of S. Spain, the Auvergne, and the Eifel, Hungary, and Asia

Minor. Ararat, Demavend in Persia, and certain volcanoes in Central Asia continue this series to the East.

It is clear that at depths of a few miles in the earth's crust, especially in regions which are undergoing or have recently undergone the process of folding, great masses of rock exist at a very high temperature and under great pressure. They contain much water vapour, occluded, but ready to expand when the pressure is relieved. The temperature is not less than 1,200° C., and may be considerably above this. Escape tends to take place along lines of weakness. In Britain there is evidence of repeated volcanic activity in bygone times.

The best general works on the subject are those by Scrope, Daubeny, Judd, Bonney, and Hull. Good illustrations have been published by Dr. Tempest Anderson. Sir A. Geikie has described the *Ancient Volcanoes of Britain* (2 vols. 1897), and in his *Text-book of Geology* (4th ed. 1903) an excellent general account of the whole subject is given.

Volchansk, tn., Kharkov gov., S. Russia, 50 m. N.E. of Kharkov city. Pop. 11,000.

Volci, or **VULCI**, an ancient Etruscan city, whose inhabitants were defeated by the Romans in 280 B.C. Its necropolis was discovered in 1828, and contained a large number of painted vases, besides objects in bronze and gold. The site of the city is 55 m. N.W. of Rome. Inscriptions and coins show that it existed until after 300 A.D.

Vole (*Arvicola*), a large genus of rodents. Voles may be distinguished from rats and mice by the fact that the tail is either short or only moderately long, the body is stouter, the muzzle more obtuse, the limbs shorter, the eyes and

ears smaller, and by the structure of the teeth. In the voles the cheek teeth (molars) consist of two rows of triangular prisms, arranged alternately; whereas in the rats and mice these teeth bear a number of tubercles, arranged in three longitudinal rows. The short-tailed field vole, popularly called the field mouse (*A. agrestis*), is abundant everywhere, and periodically occurs in vast and very destructive swarms. Such a swarm occurred in the southern counties of Scotland in 1892. A field vole breeds three or four times a year, and produces from four to six young at a time. In gardens the vole is very destructive, being the 'mouse' of which many gardeners complain. It is largely nocturnal, and makes extensive runs beneath the grass of meadows. In addition to these, burrows are constructed. Another British vole is *A. glareolus*, the bank vole, which is local in its distribution, and resembles the field vole, except that it is darker in colour and has a longer tail. Very different in habit is the water vole (*A. amphibius*), often called a water rat, which is about the same size as the brown rat. The feet are not webbed, and are naked beneath, while the colour is usually reddish brown. The water vole lives in burrows in the banks of streams. The diet consists chiefly of water plants, but field crops are also attacked.

Volga, riv. of Russia, the longest in Europe, tributary of the Caspian Sea, rises on the Valdai plateau, in gov. Tver, at 670 ft. above sea-level; flows S.E. to Rjev, then N.E. (by Tver and Uglich) to above Rybinsk; then S.E. to Yaroslavl, E.N.E. to Kostroma, S.E. to Nijni-Novgorod, E. to Kazan, S. to Simbirsk, S.E. to Samara, S.S.W. by Saratov to Tsaritsyn, and finally S.E. to Astrakhan, 40 m. above which

the delta begins. Total length, 2,310 m.; drainage area, 585,000 sq. m. It possesses only a very slight and gradual fall, and thus is excellently adapted for navigation. In spring floods the waters (e.g. at Nijni-Novgorod and Saratov) are from 10 to 13 m. across. The chief tributaries are the Mologa, Kostroma, Unsha, Oka, Vetluga, Kama, Sura, Samara, and Irghis, the Oka and Kama being themselves among the great rivers of Europe. From Nijni-Novgorod to Tsaritsyn the right bank is high and scarped, rising, between Simbirsk and Syzran, to about 1,100 ft.; the left bank is low and flat. The river becomes navigable for small vessels at Rjev, for large vessels at Tver; but the largest steamers usually stop at Rybinsk, or in later summer at Nijni-Novgorod. The river is ice-free for from 193 to 260 days. The chief Volga ports are Astrakhan, Nijni-Novgorod, Samara, Tsaritsyn, Balakovo (near Volsk), Saratov, Kazan, Rybinsk, Simbirsk, and Yaroslavl.

Volhynia, gov., W. Russia, bounded E. and S.E. by Kiev, and W. by Galicia and Poland. Area, 27,743 sq. m. Pop. 3,800,000. In the S. it is broken up by outliers of the Carpathians, but in the N. and N.W. is intruded upon by the Polesie, or marshes of the Pripiet region. In the former district occur heights of 1,200 ft. between the S. Bug and Dnieper basins, and of over 1,300 ft. at Kremenets. The whole government belongs to the basins of the Dnieper and Bug; the latter forms the W. frontier for about 100 m. Deposits of potters' clay, kaolin, iron ore, coal, lignite, graphite, jasper, and amber are found; in the S. are considerable tracts of black earth soil. Industries are principally connected with timber trade and woodwork, distilling, tanning,

brick, sugar, pitch, glass, porcelain, cloth, and candle making, machinery, and iron-working. Little Russians comprise three-fourths of the people.

Volltion. See WILL.

Voljsk. See VOLSK.

Volkligen, tn., Rhenish Prussia, 6 m. W.N.W. of Saarbrücken. Pop. (1910) 18,114.

Volkovysk, dist. tn., Grodno gov., W. Russia, 43 m. S.E. of Grodno city; with breweries, tanneries, dye works, and the manufacture of tobacco, matches, and candles. Pop. 10,000.

Volkstrust, tn., Transvaal prov., S. Africa, 174 m. E.S.E. of Johannesburg by rail, on the borders of Natal. It stands 5,400 ft. above sea level, in a large agricultural district. Pop. 2,400 (1,350 whites).

Volley Firing. In volley 'firing the men fire simultaneously by word of command. Except for certain ceremonial parades, it is now practically obsolete.

Vollmar, GEORG HEINRICH VON (1850), German socialist, born at Munich; served in the campaign of 1866, and afterwards as a papal volunteer, and in the Franco-German war (1870-1), when he was wounded and crippled at Blois. Since then he has devoted himself to politics as a social democrat. He was editor of a party organ at Dresden (1877), more than once imprisoned, and finally expelled; acted as editor of the *Social Demokrat* at Zürich (1879-82). Elected to the Reichstag (1881), he was also member of the Saxon Diet (1883-89) and of the Bavarian Diet (1893). He belongs to the more moderate wing of his party.

Vollon, ANTOINE (1833-1900), French painter, was born at Lyons, and acquired a reputation as a painter of landscapes, portraits, flowers, and fruit. His *Coin de Halle* is in the Luxembourg at Paris, and ranks as a

masterpiece, while his *Portrait d'un Pêcheur* (1868) and *Après le Bal* (1869) both gained medals.

Volney, CONSTANTIN FRANÇOIS CHASSEBŒUF, COMTE DE (1757-1820), French writer, was born at Craon in Mayenne. His first book was *Voyage en Syrie et en Egypte* (1787). Elected to the Constituent Assembly (1789), he suffered imprisonment, but his life was saved by the fall of Robespierre. He is best known as author of *Les Ruines, ou Méditations sur les Révolutions des Empires* (1791). From 1795 to 1798 he was in America. His *Œuvres Complètes* appeared in 8 vols. (new ed. 1836). See a monograph by Berger (1832), and Sainte-Beuve's *Causeries du Lundi*.

Volo, seapt. tn., Larissa prov., Greece, on E. coast of Thessaly, at head of Gulf of Volo, 33 m. S.E. of Larissa. It is an archiepiscopal see. Pop. 24,000.

Vologda. (1.) Government, N. Russia, bounded N. by Archangel, and E. by the Ural range. Area, 155,498 sq. m. Pop. 1,600,000. Except in the N.E. and S.S.W., the surface is flat, thickly covered by forests, and cut up by innumerable rivers, mostly belonging to the basin of the N. Dwina, the rest to that of the Petchora, Volga, and Mezen. But in the N.E. Vologda contains the highest summits of the Urals (e.g. Tölpos-Iss, 5,500 ft.). Lakes are numerous but small, and a large proportion of the government is covered with marshes. The mineral wealth is considerable, especially in salt and iron; millstones, grindstones, and naphtha are also yielded. The industries are mostly concerned with timber. Salt deposits are worked, iron and earthenware objects manufactured, and jewellery and filigree work are made. There are also cloth mills, oil works, candle, flax, paper, and bristle manufactories. Nine-tenths of the people

are Russians; the remainder belong to the Zyryanian and other Finnish stocks. (2.) Town, N. Russia, cap. of Vologda gov., 108 m. N. of Yaroslavl, and on the Vologda, is a river port, and possesses some ancient churches, including the cathedral of St. Sophia (1568). Pop. 29,000.

Volsci, ancient Italian people, who inhabited the eastern half of Latium. During the 5th and 4th centuries B.C. they were constantly at war with Rome, but by 304 B.C. had become Roman citizens. Their chief towns were Antium, Satrium, Privernum, Arpinum, and Fregellæ. Racially they were akin to the Umbrians and Oscans.

Volsinii. See ORVIETO.

Volsk, tn., gov. of Saratov, Russia, on r. bk. of Volga, 65 m. N.E. of Saratov; has iron works, tanneries, and flour mills. Pop. 28,000.

Volsunga Saga, in old Norse literature, the mythical history of the Volsungs and Nibelungs. Its central hero is Sigurd the Volsung (the Siegfried of the *Nibelungenlied*). It forms part of the *Elder Edda*. See W. Morris's *Story of Sigurd the Volsung* (1898).

Volt, the practical electric unit of electro-motive force (E.M.F.), equalling 10^8 c.g.s. electro-magnetic units of electro-motive force. The standard of E.M.F. is that of the Board of Trade Clark cell, which gives at 15° c. 1.434 volts. Electro-motive force is equivalent to difference of potential between two points; it is what sustains a current in a closed circuit. It is also spoken of as electric pressure on analogy with water pressure; also as voltage when the difference of pressure is measured in volts. See ELECTRICITY, CURRENT.

Volta, riv. of W. Africa, which flows generally s. into the Gulf of Guinea, near Adda. Its

sources are in about 11° N. lat. and 5° W. long. For part of its course the Volta forms the boundary between Togoland and the Gold Coast. Length, 900 m.

Volta, ALESSANDRO, COUNT (1745-1827), Italian physicist, born at Como. In 1777 he travelled through Switzerland, making the acquaintance of Haller, Voltaire, and Saussure, and in 1779 was elected professor in Pavia University. In 1782 he took a long journey through France, Germany, Holland, and England (where he met Priestley). In 1815 the Emperor Francis appointed him director of the philosophical faculty of Padua, from which he retired in 1819. Volta invented (1775) the electrophore and an electrical condenser (1782). He also constructed the earliest absolute electrometer and the electric pile, the latter of which was first described in a letter to the Royal Society of London, March 20, 1800. His *Opere Complete* were published in 1816. See Bianchi and Mochetti's *Vita di Volta* (1829-32), and Volta's *Alessandro Volta* (1875).

Voltaic Cell. See CELL, VOLTAIC.

Voltaire, FRANÇOIS MARIE AROUET DE (1694-1778), French writer, born at Paris, son of François Arouet, an official of one of the high courts. He was educated at the Jesuit Seminary of the Collège Louis-le-Grand in Paris. At this time Ninon de L'Enclos gave him lessons in social deportment, and left him a legacy; and he was introduced to the Société du Temple, in which the best intellectual society of Paris was to be found side by side with the most reckless dissipation. Soon a stream of satires, epigrams, odes, and epistles began to pour from Voltaire's pen, and the larger portion of *Edipe* was then written. In 1712 he was an unsuccessful competitor for the prize offered

by the French Academy for the best ode on the subject of the restoration of the choir of Notre Dame. After some time spent in the study of the law, on the death of Louis XIV. he wrote a foolish satire on the regent (the Duc d'Orléans), for which he was imprisoned (1717) in the Bastille. On his release his play *Edipe* was produced at the Théâtre Français, and proved a brilliant success. He then took the name of Voltaire. In February 1720 his second play, *Artémire*, was produced, achieving, however, only a *succès d'estime*. In 1724 his play of *Marianne* was produced, with the young actress Adrienne Lecouvreur in the title rôle; but shortly after another quarrel again brought him inside the Bastille. Shortly before this his *La Henriade*, a noble poem on Henry IV., had seen the light. On being released from the Bastille Voltaire went to England (1726-9), and there through Bolingbroke formed friendships with the leading English statesmen and writers, and studied the political and religious conditions of the country. After returning to Paris he devoted himself to literature and to commercial speculations, from which he realized a large fortune. But his indignation over the treatment meted out by the clergy to the remains of Adrienne Lecouvreur, and his contempt for court sycophancy and intrigue, led him to speak with satiric bitterness of the powers that then were in his *Lettres Philosophiques* (1733) and *Épître à Uranie*. With a friend, Madame du Châtelet, and her husband he retired to Cirey, a château on the borders of Champagne and Lorraine, where from 1734 to 1749 he resided, immersed in study and literary labours. During this period some of his best work was executed—the three plays, *Alzire*, *Mahomet*, *Mérope*;

his *English Letters*; his satiric poem *La Pucelle*; and his philosophical works, *The Treatise on Metaphysics* and *Essai sur les Mœurs et l'Esprit des Nations*, which, with all its defects, still takes rank as one of his finest treatises; also *Zadig* and his Eastern romances. In 1740 Frederick the Great of Prussia invited Voltaire to visit him. Though this did not come off until a year or two later, an intimacy was established between the monarch and the man of letters, and the latter saw a treatise by Frederick, entitled *Anti-Machiavel*, through the press. In 1743 Voltaire was sent on a secret mission to Frederick. For this service, through the influence of Louis XV., he was elected a member of the French Academy (1746), and appointed historiographer-royal. After the death of Madame du Châtelet (1749) Voltaire was induced to proceed to Paris, then to visit Frederick of Prussia at Berlin (1751). He spent three years in Prussia, having apartments assigned to him at Potsdam, a pension of 20,000 francs, a chamberlain's gold key, and a cross of merit, his only duty being to correct his majesty's writings. Frederick and Voltaire, however, could never agree for any length of time, and at last they agreed to part, professedly for a time, but Voltaire determined never to return. While there he published his *Siècle de Louis Quatorze*. After leading an unsettled and migratory life for some years, Voltaire finally settled down near Geneva at Ferney, where he spent the last twenty years of his life. *Candide*, *Siècle de Louis Quinze*, *Dictionnaire Philosophique*, *A Treatise on Toleration*, and his last tragedy, *Irène*, all fall within this period. His rancour against the church increased with years, and from his retirement he discharged a ceaseless succession of

satiric shafts at the clergy and their dupes. Voltaire died whilst on a visit to Paris. The curé of St. Sulpice refused to inter the body, so the remains had to be hurriedly buried in the Abbey of Scellières. In 1791 the body was transferred to the Panthéon, but during the excitement of the 'hundred days' it was removed, and thereafter all trace of it was lost. Voltaire as a poet fails to touch the heart, nor does he ever appeal to the deeper sympathies of human nature. His dramas are ill-constructed, but they abound in apt and clever character sketches, and reveal a great fund of wit. As a satirist Voltaire is one of the greatest. The best edition of his *Œuvres* is that by Moland in 32 vols. The best *Lives* are those by Desnoiresterres (8 vols. 1887), James Parton (1881), and Tallentyre (2 vols. ed. 1905). See also Morley's *Voltaire* (1872; later ed. 1886), Lanson's *Voltaire* (1907), and Tallentyre's *The Friends of Voltaire* (1907); also biographies by Hamley (*Foreign Classics for English Readers*, 1877) and by Espinasse (*Great Writers Series*, 1892).

Voltmeter, the name given to an instrument which measures current strength by the amount of a given electrolyte decomposed in a given time. See **ELECTRICITY, CURRENT**.

Volterra (anc. *Volaterræ*), tn., Pisa prov., Italy, 32 m. S.E. of Pisa; has manufactures of alabaster goods, iron, boracic acid, and salt. The national museum, in the Tagassi palace, contains an interesting Etruscan collection. Pop. 14,000. See Ricci's *Volterra* (1905).

Volterra, DANIELE DA (c. 1509-66), Italian artist, whose real name was Daniele Ricciarelli, born at Volterra; became the assistant of Michael Angelo,

painting some of the great Florentine's designs, especially *David and Goliath* (Louvre). Latterly he excelled as a sculptor. His masterpiece in painting is *The Descent from the Cross*, a fresco in the church of the Trinità dei Monti at Rome.

Voltmeter, an instrument for measuring electro-motive force or pressure in volts. The instrument is connected by wires to the two points between which the pressure is to be ascertained (e.g. the two terminals of a dynamo or battery), and a pointer, actuated by the mechanism, moves over a graduated scale. There are four types in general use, of which one, the electrostatic, is the only direct pressure indicator. Two insulated pieces of metal become oppositely electrified by the electric force between them, and hence attract each other, the force of attraction giving a measure of the E.M.F. (See **ELECTROMETER**.) These can be used equally well for continuous and for alternating pressures, and are specially suitable for high pressures, as they consume no current. They are free from temperature errors, and are quite independent of magnetic influence. The other types depend on Ohm's law, that with a given resistance the current is proportional to the pressure, and are really current-measuring instruments. To economize current the resistance is made large, and where it is inconvenient to give a sufficiently large resistance to the instrument proper an extra resistance of fine wire is added. This can be made of a special alloy, such as manganese, the resistance of which does not appreciably alter with temperature, and thus changes in the temperature of any copper wires used affect only a small part of the total resistance, and the

latter remains substantially constant. Three types are in use:—

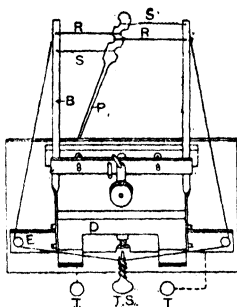


FIG. 1.—Cardew Voltmeter.

a, Rigid wires; s, light springs; m, brass bar; n, brass block; r, spring bow or levers; p, pointer; t, terminals; ts, tension screw.

1. *Hot Wire Instruments* (Fig. 1).—In these a small current passes through a fine stretched wire of high resistance, and the heat produced causes it to increase in length. Magnifying levers are moved by this extension, and the movement is finally shown by a pointer over a scale. These instruments can be used either for continuous or for alternating currents, since both alike cause heating. They are very convenient for low pressures, but as a certain minimum current is required to heat the wires, they are inconvenient for high pressures, except by the use of additional apparatus.

2. *Moving Coil Type* (Fig. 2).—In these a coil of fine wire is pivoted on jewelled centres, and placed between the poles of a powerful horse-shoe magnet, with curved pole pieces. Inside of the coil is a cylinder of soft iron to concentrate the magnetism, and the coil rotates in the space between the pole faces and the cylindrical core. Current is led into the coil

and out again by spiral metal springs attached at one end to the frame, and these also serve to bring the coil back to the zero mark. When current flows through the coil, magnetic action causes the wires to traverse the magnetic field in the gap, and the coil rotates through an angle proportional to the current, and therefore proportional to the pressure. The instruments are very sensitive and accurate, and the magnet, if carefully made, retains its magnetism practically unchanged for years. They are used only for continuous currents.

3. *Soft Iron Type* (Fig. 3).—These are similar to the ammeters of this kind, but are not accurate instruments. As the coil requires very many turns of fine wire, its resistance is high, and the copper resistance is therefore a considerable portion of the whole, thus producing an appreciable error when the instrument becomes heated by the current.

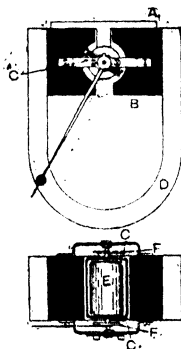


FIG. 2.—Moving Coil Voltmeter.

a, Brass; m, soft iron pole pieces; c, moving coil; n, permanent magnet; e, iron core; r, hair springs (phosphor bronze).

Also the residual magnetism of the iron produces considerable

errors, and they have not the accuracy usually required for the regulation of electrical pressure. Owing to the self-induction of the coil there are errors produced when used for alternating cur-

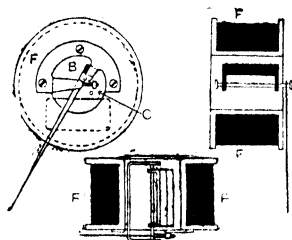


FIG. 3.—Soft Iron Voltmeter.

B, Soft iron weight; C, balance; F, fine copper wire.

rents, while they are inferior to the moving coil type for continuous currents. They are also easily influenced by the magnetic action of currents or of dynamos in the neighbourhood.

Instruments of the dynamometer pattern, using the attraction or repulsion between two coils, can also be used as voltmeters by making the coils of fine wire; but they are expensive.

Voltri, tn., Genoa prov., Liguria, Italy, on Gulf of Genoa, 9 m. by rail N.W. of Genoa; has manufactures of paper, cotton and woollen goods, and iron. There is also shipbuilding. The French under Masséna were defeated here by the Austrians in 1800. Pop. 15,000.

Volumenometer. See SPECIFIC GRAVITY.

Volumetric Analysis. See ANALYSIS.

Voluntaryism, the theory which maintains that churches and clergymen should be supported by voluntary contributions, and not depend upon state aid, and this in the interest of religious liberty and equality. The

Liberation Society was formed to advocate these principles through its organ the *Liberator*, and is opposed by the Church Committee for Church Defence.

Volunteers. With the establishment of Napoleon's camp at Boulogne there commenced a long period, from 1803 to 1815, of imminent danger of invasion, and a force of volunteers, stated in the estimates of 1803-4 to amount to 463,000 men, was raised for local service. After the peace of 1814 the infantry volunteers fell almost entirely into abeyance; but the successes of the French in N. Italy in 1859 gave, in England, fresh impetus to the volunteer movement, and the force speedily rose from 70,000 to 180,000 men. In 1906 it had a strength of 340,000 men, of whom nearly 242,000 were efficient. In that year it was reorganized by Mr. (now Viscount) Haldane into the present Territorial Force. See TERRITORIAL FORCE.

NAVAL VOLUNTEERS.—A reserve force known as the Royal Naval Artillery Volunteers was raised in 1873; it was made up of brigades, each consisting of four or more batteries of sixty or eighty men. The officers were commissioned by the Admiralty, and ranked with, but after, naval officers and royal naval reserve officers. The force was disbanded in 1892, but was revived in 1904.

Volute, in architecture, the scroll or spiral ornament forming the characteristic feature of the Ionic capital. The original Greek volute—e.g. on the Erechtheum at Athens—is on the front and back only of the capital, which involves a difficulty in a peripteral building. There is an example of a Greek angle volute in the temple at Bassæ; but it is only in Roman work that we see this idea perfected.

Volvox, a colonial flagellate protozoon which is so plantlike

in its characters that it is by botanists usually included in the Algae. Volvox is a hollow ball of cells, the cells being embedded in a membranous envelope. The method of nutrition is entirely plantlike. Two types of reproduction occur. Certain cells of the colony, by repeated division, give rise to small new colonies. These minute colonies escape into the water by the rupture of the envelope of the parent colony, and there grow into colonies like the parent. This mode of reproduction goes on throughout the earlier part of the summer; but later a new type of colony appears, in which there are a large number of specialized reproductive cells, which are without flagella, and are of large size. Certain of these become ova, while others give rise to a great number of active minute cells comparable to spermatozoa. These cells are set free, and proceed to fertilize the stationary ova. As a result zygotes are formed, which have a very thick cell wall of cellulose, and remain dormant through the winter, giving rise to new colonies in spring. The species of Volvox are all found in fresh water; a common form is *V. globator*.

Volvulus, a condition of the intestine in which a part is twisted or kinked, so that the passage is closed. It is thought to be caused by accumulation of gas, or by chronic constipation. Symptoms are acute pain in the abdomen, often distinctly located, with constipation and vomiting, the onset being rapid.

Vomiting, the forcible expulsion of the contents of the stomach through the œsophagus. The act is generally preceded by nausea and a rush of saliva. Vomiting may be excited by stimulation of (1) the vomiting centre in the medulla, and (2) various afferent nerves. The

stimuli capable of exciting vomiting are exceedingly numerous—indigestible food, emetics, intestinal obstruction, peritonitis, constipation, lung disease, pregnancy, renal calculus, cerebral inflammations and tumours, hysteria, shock, disturbances of the balancing centre, and visual or olfactory impressions. Ice, bismuth, hydrocyanic acid, opium, and morphine are local anti-emetics, and counter-irritation over the stomach acts in similar fashion. Opium, morphine, and hydrocyanic acid have also a sedative action on the vomiting centre, whose irritability is likewise decreased by such drugs as chloral, potassium bromide, belladonna, and creosote.

Von Bülow, BERNHARD, COUNT. See BÜLOW.

Vondel, JOOST VAN DEN (1587-1679), Dutch poet, born at Cologne of Anabaptist refugee parents. He returned to Amsterdam as a hosier (1610), was ruined (1658), and pensioned (1668). His works, chiefly tragedies, were published by De Vries (1820) in 21 vols., and by J. van Lennep in 12 vols. (1850-69; new ed. 1888). His *Lucifer* (1654) is said to have been drawn upon by Milton for *Paradise Lost* (begun 1658), as his *Samson* for *Samson Agonistes*. Vondel first employed Mary Stuart (1646) as a theme for dramatic poetry, translated Horace, Virgil, and Ovid, and wrote beautiful lyrics. His *Palamedes* (1625) satirizes the judicial murder of Barneveldt. See studies by Baumgartner (1882) and Looten (1889).

Von der Decken. See DECKEN.

Voodooism, a degraded form of religion, prevalent among the negroes of Haiti and the southern states of America. It is supposed to be a relic of the fetishistic religion of equatorial Africa; and the word is probably derived from *voudoux* ('negro sorcerer'),

a Creole form of the French *Vaudois* (Waldenses), who were represented by their enemies as addicted to the practice of sorcery and necromancy. See Hesketh Prichard's *Where Black Rules White* (1900).

Voorst, comm., Netherlands, in Gelderland, 16 m. N.E. of Arnhem. Pop. (1910) 10,766.

Voragine, JACOBUS DE. See GOLDEN LEGEND.

Vorarlberg, dist. Austria, w. of Tyrol; forms with Tyrol a prov. of Austria. It covers 1,004 sq. m. The capital is Bregenz. Cattle and goats are raised, and milk products exported. Pop. (1911) 145,794 (mainly German and Roman Catholic).

Vörde, vil., Prussia, in prov. of Westphalia, 28 m. E. by N. of Düsseldorf. It has manufactures of iron and steel goods. Pop. (1910) 7,844.

Voronej, or VORONEZH. (1.) Government of Central Russia, bordered by Orel and Tambov on N. and by Kharkov on S. Area, 25,443 sq. m. Pop. 3,300,000. The surface is a rolling plain, and belongs to the Don basin. The chief mineral deposits are iron, ochre, potters' clay, sulphur, and peats. The soil is very fertile (mostly black earth). Market-gardening is a prosperous industry. The larger industrial establishments include sugar refineries, flour mills, iron works, bell-making works, and manufactures of tobacco, soap, and candles. More than 99 per cent. of the people are Russians (three-fifths Great Russians, and two-fifths Little Russians), and belong to the Orthodox Greek Church. (2.) Town, Central Russia, cap. of Voronej gov., 120 m. S.W. of Tambov. It is an episcopal see; has a cathedral and a citadel, with palace of Peter the Great; manufactures soap, candles, bricks, tobacco, woollen and linen cloth, and vitriol. Pop. 75,000.

Vorösmarty, MICHAEL (1800-55), Hungarian poet, born at Nyék, Szekesfehervar co.; became a teacher and afterwards an advocate, but soon abandoned law for literature. He is best known as the writer of the Hungarian national song *Szozat* (1840); but he also issued plays and epic poems (e.g. *Zalan Futasa*, *Cserhalom*, *Eger*) which secured for him the membership of the Hungarian Academy (1830), and subsequently its secretaryship. A complete edition of his works was issued by P. Gyulai (1884) in 12 vols.

Vortex, in hydrodynamics, a kind of motion in which we imagine the smallest parts of the fluid to be whirling or rotating. Sir G. G. Stokes was the first clearly to show that two kinds of fluid motion could be distinguished according as there was rotation or was not rotation in its smallest elements. But we owe to Helmholtz the complete investigation of the fundamental properties of vortex motion in a perfect frictionless or non-viscous fluid. In such a fluid it is not possible either to create or to destroy vortex motion, the property of vorticity being possessed once for all or never. We may imagine the vorticity at a point in a fluid to be represented by a vector drawn perpendicular to the plane of molecular rotation and of length equal to the amount of the vorticity. As we proceed along this line we necessarily pass to an immediately contiguous element also possessing vorticity. The vortex line or filament so traced out will either terminate at the boundary of the fluid or form a re-entrant closed path coming back to the point from which we started. This gives us the vortex ring. Such a vortex ring will always be composed of the same elements of fluid. It was this conception which led Lord Kelvin to his theory of the

vortex atom. The properties just mentioned belong to vortex motion in a non-viscous fluid. But practically there are no such fluids. Because of the existence of viscosity we can create evanescent vortex motions in fluids. Such, for example, are the smoke rings produced at the funnel of a locomotive or at the mouth of a skilful smoker.

Vorticella, or **BELL-ANIMALCULE**, a ciliate protozoon, found abundantly in ponds and ditches, and even in vegetable infusions. In general appearance it is like an inverted bell, with a long handle, which forms the stalk that attaches the protozoon to the substratum, and has a contractile filament running down its centre. When this filament contracts it throws the stalk into a spiral, and thus brings the bell close down to the substratum. The bell constitutes the body of the animalcule. It is fringed with cilia round the margin, but what would be the mouth of the bell is largely filled up by a plug, called the disc, which also bears cilia. Between the disc and the margin is a groove leading into the interior, which corresponds to the mouth of *Paramoecium*. Internally there are two nuclei, a large and a small, a contractile vacuole and food vacuoles, much as in other Protozoa. *Vorticella* is a solitary form; but its near ally *Carchesium* is colonial, a number of bells occurring on one stalk. The ordinary method of reproduction is by fission. But a process of conjugation occurs in that two or more small free bells swim away, and attach themselves to a full grown stationary bell. These then completely fuse together, so that a zygote is formed, which again begins to divide in the usual fashion.

Vortigern (fl. 450), British prince, who called in the Saxons against the Picts and Scots.

Vos, CORNELIS DE (1585-1651), Flemish painter, born at Hulst, where he became dean of the painters' guild (1619). He imitated Van Dyck and Rubens, and became celebrated as a painter of portraits and religious subjects. His portrait of the silversmith Abraham Grapheus is his best performance.

Vos, MARTIN DE (1532-1603), a Flemish painter, born at Antwerp, where, like the preceding, he became dean of the painters' guild (1571). He possessed a fertile invention, a ready pencil, and a colouring approaching that of Tintoretto.

Vosges, a frontier dep. of E. France, abutting on Alsace. The surface is mountainous, with the Vosges Mts. in the E. and spurs from the Langres plateau in the W. The upper Moselle, on which the capital, Epinal, stands, bisects the department. Much of the mountainous area is under wood; the W. is agriculturally fertile; and the department possesses mines of coal, silver, lead, and copper, quarries of lithographic stones, and, above all, many mineral springs, as at Plombières and Contrexéville. Important manufactures are those of iron and steel (at Epinal and Bru), and embroidery and lace (at Mirecourt and St. Dié). Area, 2,303 sq. m. Pop. 430,000.

Vosges Mountains (Ger. *Vogesen* or *Wasgau*) separate the French departments of Meurthe-et-Moselle and Vosges from the German territory of Alsace-Lorraine. Starting from Basel northward, they border the left side of part of the Rhine valley, and throw off the rivers Saar and Moselle to the N. The highest point, Ballon de Guebwiller (about 4,680 ft.), is at the S. end. The Vosges valleys are specially noted for cattle, and the W. slopes are thickly forested.

Vosmaer, CAREL (1826-89), Dutch poet and art critic, born at the Hague. Till 1873 he followed the legal profession. His first volume of poems appeared in 1860, followed by *Rembrandt* (1869) and *Birds of Diverse Plumage* (1872-6). After a visit to Alma Tadema (1873) he produced *Londinias* (1878), a mock-heroic poem. His works also include Homer, translated into hexameters; *Nanno* (1882), an idyll; and *Amazone* (1881), an archæological novel. As editor of the *Nederlandsche Spektator* he played an influential part in reawakening Dutch literature.

Voss, JOHANN HEINRICH (1751-1826), German poet, philologist, and translator, born at Sommersdorf (Mecklenburg); was a schoolmaster at Otterndorf (1778) and at Eutin (1782), removing (1802) to Jena, and becoming professor at Heidelberg (1805). He engaged in controversy with Heyne, whose pupil he had been (*Mythologische Briefe*, 1794); with Creuzer (*Antisymbolik*, 1824-6); attacked Stolberg and Schlegel (*Kritische Blätter*); and was one of the chief spirits in the poetic republic of the *Göttinger Dichterbund*. His original idyll *Luise* (1795) suggested *Hermann und Dorothea* to Goethe. Excelling in the use of the hexameter, he translated Homer (1793), Virgil's *Georgics* (1789) and *Eclogues* (1797), Ovid's *Metamorphoses* (1799), Horace (1806), Bion (1808), Hesiod (1806), Tibullus (1810), Propertius (1830), Aristophanes (1821), Shakespeare (1818-29), and Aratus (1824). His *Gedichte* (collected 1802) were not the least important of his works. His *Sämtliche Werke* appeared in 5 vols (1853). See *Lives* by Paulus (1826) and Herbst (1872-6).

Vossius, GERHARD JOHANN (1577-1649), Dutch scholar, born near Heidelberg; became rector of the high school at Dordrecht

(1600), director of the theological college at Leyden (1615-19), and professor of rhetoric there (1622). Crossing to England, he was made canon of Canterbury Cathedral (1629). He returned to Holland, and was appointed professor of history in the University of Amsterdam (1631). His chief work was his *Historia Pelagiana* (1618).

Vossius, ISAAC (1618-89), Dutch philologist, son of Gerhard, born at Leyden. He travelled extensively over Europe, collecting MSS., and on the invitation of Queen Christina resided in Stockholm (1649-52). He settled in England (1670), and was appointed canon of Windsor (1673). His works include scientific treatises (*De Motu Marium et Ventorum*), a book of table talk (*Scaligerana*), a criticism of religion (*De Sibyllinis aliisque quæ Christi Natalem præcessere Oraculis*), and editions of the classics (*Catullus*, 1684).

Votan, legendary lawgiver and civilizer of Central America, more especially of Mexico. He was stated to have come from overseas, and to have found there a rude and uncivilized people, dressed in the skins of wild animals, and living on roots and fruits and raw flesh, but speaking one common language. This last he supplanted by his own tongue, Nahuatl. He taught the people a knowledge of the supreme deity, gave them a settled government, and instructed them in some of the arts of civilized life. He was subsequently deified. Votan's civilization was supplanted by that of the Mayas. See Brasseur de Bourbourg's *Histoire des Nations Civilisées du Mexique et de l'Amérique Centrale* (4 vols. 1857-9).

Vote. See ELECTIONS.

Votkinsk, or KAMSKO-VOTKINSKIY, tn., Russia, gov. of and 200 m. S.E. of Vyatka; manu-

factures vehicles and agricultural machinery. Pop. 21,000.

Vow, an obligation voluntarily undertaken before God. Vows were practised by all nations of antiquity—e.g. Jephthah's vow. Though they were not encouraged by Jesus Christ, there are instances of vows among the early disciples (Acts 18:18; 21:23). The Roman Catholic Church has systematized the taking of vows and their operation. Dispensation from minor vows may be obtained from a religious superior or bishop; but such vows as that of chastity or membership in a religious order may only be dispensed by the pope. A distinction is made between 'simple' and 'solemn' vows. Vows are defined as solemn when made in religion and accepted by the church as perpetual; simple, when either of the conditions is wanting to make them solemn. The only vows officially recognized by the Church of England are the baptismal vows and the marriage vows. Vows, however, are not unfrequently made in connection with brotherhoods and sisterhoods, which are recognized by the bishop of the diocese according to his discretion.

Vowel. See PHONETICS.

Voysey, CHARLES (1828), founder of the Theistic Church, was born in London. Ordained a clergyman of the Church of England, he was deprived in 1871, in consequence of certain publications which were adjudged heterodox. His principal works are *The Sling and the Stone*, in 10 vols. (1866-93), and *Theism as a Science of Natural Theology and Natural Religion* (1895).

Voznesensk, tn. and river port, Kherson gov., S. Russia, 80 m. N.N.E. of Odessa, on the S. Bug; with a cathedral, former royal palaces, and fine public gardens, distilleries, and breweries. Pop. 14,000.

Vranya, or VRANYÉ, tn., cap. of Servian dep. of same name, near the southern extremity of the kingdom, on the upper Morava; has rope manufacture. Pop. 11,500. The dep. has an area of 1,675 sq. m. and a pop. of 113,000.

Vratsa, tn., Bulgaria, on N. slope of the Balkans, 38 m. N.N.E. of Sofia; has tanneries, and wine, silk, and jewellery industries. It is the seat of an archbishop. Pop. (1910) 15,179.

Vrede, tn., in the E. of the Orange Free State prov., S. Africa, 34 m. S. of Standerton (Transvaal). It is the centre of one of the best cattle, sheep, and horse breeding districts in the province. Pop. 1,600.

Vriezenveen, comm., Netherlands, in Overijssel, 45 m. N.E. of Arnhem. Pop. (1910) 5,190.

Vryburg, tn., cap. of dist. of same name, and of British Bechuanaland, S. Africa, 127 m. by rail N. of Kimberley; was capital of the republic of Stellaland. Pop. 3,000.

Vryheid, tn., Natal, 291 m. by rail N. by W. of Durban. It lies in a rich mineral district (coal, iron, copper, gold, silver, lead, etc.). Pop. 2,300 (1,350 whites). The district of Vryheid was ceded by Dinizulu in 1884 to some Boers. It was incorporated in the Transvaal in 1888, but four years later was transferred to Natal. Area, 4,265 sq. m. Pop. 65,000 (3,000 whites).

V.S., Veterinary Surgeon.

Vught, comm., Netherlands, on the Dommel, in N. Brabant, 39 m. E.S.E. of Rotterdam. Pop. (1910) 6,703.

Vukovar, tn., Hungary, in Croatia-Slavonia, on the Danube, 25 m. E.S.E. of Esseg. The industries include flour-milling, distilling, and sericulture. Pop. 10,000.

Vulcan, the name given by Leverrier to a supposed intra-

Mercurian planet, the existence of which he predicted in order to account for irregularities in the motion of Mercury. In 1859 Lescarbault observed the passage across the sun of a small black disc, and Leverrier, on discovering the observations, deduced a period of twenty days for the revolution of the supposed planet, and fixed dates for its future transits. They, however, failed to take place, and Lescarbault's observation is now admitted to have been illusory. Illusory, too, was the hurried recognition of Vulcan by the American astronomers Watson and Swift during the total eclipse of July 29, 1878.

Vulcanizing and Vulcanite.

See INDIA-RUBBER.

Vulcano. See LIPARI ISLANDS.

Vulcanus, in earliest Roman times was a kindly nature *numen*, who cherished with warmth the fruits of the earth, and in this connection was worshipped along with the Bona Dea. Later he became a *heat* spirit, hard to control, and, under Greek influence, was connected with Hephaestus, and became the god of fire. The earliest temple to him was built previous to 215 B.C., but the exact date is unknown. His chief festival was on August 23, when, as the harvest was newly stored in granaries, and fire would be a national disaster, the fire-god needed to be propitiated. See W. Warde Fowler's *Roman Festivals* (1908).

Vulgate, the authorized Latin version of the Bible, made by Jerome (383-405 A.D.). At its foundation lies a previous Latin version, the Old Latin, sometimes unwarrantably called the Itala, which probably came into existence at Carthage. In this, the Old Testament translation, embracing also the Apocrypha, was made from the Septuagint, while the New Testament omitted three epistles (Hebrews, James, 2 Peter).

About the year 382 Pope Damasus requested Jerome to prepare a revision of the New Testament. Jerome began with the gospels, which he emended with great caution and care (383), then passed on to the rest of the New Testament, which was executed with less thoroughness. Next he took in hand the Old Testament. Of the Psalms he had made two revisions, called the Roman and Gallican respectively, the latter of which still stands in the Vulgate. By the 6th century this version was officially recognized by Gregory the Great. Attempts to find out Jerome's actual text began to be made—*e.g.* by Alcuin (c. 801), Theodulf, bishop of Orleans (c. 800), Lanfranc (c. 1070), Stephen Harding (c. 1150); finally, R. Stephens was able to issue (1528) a fairly valuable critical edition. The Council of Trent (1546) having declared Jerome's work to be authentic (probably, that is, authoritative and accurate), and made an injunction as to correct printing, Hentenius of Louvain (1547) brought forth his beautiful folio edition. There was as yet, however, no real uniformity, and it was not till 1590 (Pope Sixtus v.) that a fully authorized edition appeared. Even this gave place in 1592 to the issue made under Clement VIII., which, as revised in 1598, became the definitive Roman Catholic edition. The differences between the Vulgate and the English Bible, apart from variations in rendering, are confined mainly to the order in which the books appear, the chapter divisions, and the presence or absence of the Apocrypha; and these only relate to the Old Testament. See Kaulen's *Geschichte der Vulg.* (1868), and *Handbuch zur Vulg.* (1870); Berger's *Histoire de la Vulg.* (1893); Nestle's *Uebersetzungen der Bibel* (1897); Scrivener's *Introd. to Criticism of N.T.*

(4th ed.); editions of the Vulgate by Vercellone (1861), Tischendorf (N.T., 1864).

Vulpecula, a small constellation to the south of Cygnus in a dense part of the Milky Way, formed by Hevelius (d. 1687), and formerly called *Vulpecula et Anser*. The wonderful 'dumb-bell' nebula, Messier 27, belongs to this constellation. *Vulpecula* varies from 5.5 to 6.5 magnitude in 4 d. 10½ h.

Vulture, a name applied to the members of two families of birds of prey—the American *Cathartidæ* and the Old World *Vulturidæ*. In both families the bill is strong and hooked, and the head and neck largely bare of feathers; the legs are strong, but the feet and claws are somewhat weak, so that the birds cannot carry off their food as the eagles can. The sexes are alike in plumage, and the powerful wings have eleven primaries. Vultures sometimes reach a great size, this being specially true of the American forms, and they have a powerful and sustained flight. The food consists of carrion, though the larger forms will attack feeble or disabled animals. The sight is exceedingly keen. Of the *Cathartidæ*, important forms are the condor, the turkey-buzzards, and the carrion crow or black vulture (*Catharista atratus*), the last extending north to Carolina. The turkey-buzzards are common in the towns and villages of tropical and temperate America. Of the Old World *Vulturidæ*, examples are the black vulture (*Vultur monachus*) of the Mediterranean region, the griffon vulture (*Gyps fulvus*) of Southern Europe, and the small Egyptian vulture, or Pharaoh's hen (*Neophron pernopterus*), which is so frequent in Egyptian hieroglyphics.

Vurjeevandas, MADHOWDAS (1817-96), Hindu merchant and

philanthropist, was born in Kathiawar, and established himself in business in Bombay. In honour of his father he constructed and endowed the Madhow Bang, for the use of poor Hindus; built *dharmshalas* at Bombay and at Nassick, a sanatorium at Zion Hill (Bombay I.), a dispensary at Matoonga (Bombay I.); and instituted an annual feast for the poor of his caste.

Vyatka. (1.) Government, N.E. Russia, bounded on E. by Perm. Area, 59,329 sq. m. Pop. 3,700,000. The surface is fairly level, thickly wooded in many parts, and cut up by rivers. Almost the whole area is included in the Volga drainage region, through the Kama (320 m. within limits of government) and the Vyatka. Marshes are very extensive. The chief mineral is iron; copper, mixed with iron ore, is also extracted; deposits of potter's earth, millstones, and sulphur exist. The chief crops are rye, oats, and barley; potatoes, flax, and hemp are also grown. The industries include shoe, match, paper, cloth, tobacco, and furniture factories, fulling mills, flour mills, iron and glass works, and locksmiths' shops. (2.) Town, Russia, cap. of Vyatka gov., nearly 200 m. N. of Kazan, on the Vyatka. It is a river port and episcopal see, with a splendid cathedral (1683), and remains of ancient citadel and ramparts. It has manufactures of tobacco, glue, soap, paper, candles and tapers, leather, silver and copper articles, and ecclesiastical art objects. It was founded from Old Novgorod about 1180-1, and is still called Noúgrad by Tartars and Chermians. Pop. 43,000.

Vyazma, tn., Smolensk gov., Central Russia, 90 m. E.N.E. of Smolensk; with a cathedral (1596) and citadel, and manufacture of



Species of Vultures.

1. Egyptian vulture. 2. Condor. 3. Griffon vulture. 4. Black vulture. 5. King vulture. 6. Turkey vulture.

leather and leather goods, tobacco, and gingerbread, this last famous all over Russia. Pop. 16,000.

Vyernii, formerly **ALMATY**, tn., Russian Central Asia, cap. of Semirychensk prov., 382 m. E.N.E. of Tashkend, at N. foot of Trans-Iliian Ala-tau, 2,405 ft. above sea-level. It has a cathedral, a school of horticulture, a Moham-medan college, and considerable trade. Cattle-breeding and bee-keeping are carried on. Vyernii is famous for its Nestorian inscriptions (from 8th century). Earth-quakes are frequent; an especially severe one occurred in 1887. Pop. 27,000.

Vyrnwy, riv., Wales, rises in N.W. Montgomeryshire, and joins the Severn on the Shropshire border. Its upper valley, 68 m. from Liverpool, has been converted into a lake (alt. 825 ft.) by a dam 1,225 ft. long and 60 ft. high, forming the head reservoir for the Liverpool water supply (1890-1905).

Vyshnii-Volochok, tn., Tver gov., Central Russia, 68 m. N.W. of Tver city; with cotton mills. The Vyshnii-Volochok system is one of the three canal systems uniting the Baltic and Caspian basins. It was constructed by Peter the Great (1703-9). Pop. 17,000.

W

W. English *w* is closely related to the vowel *u*, and may be termed consonantal *u*. It is probable that Latin *V* or *U*, which were formerly undistinguished, had this value after *Q*. *W* is simply *V* written twice. It appears from the 6th century (Wattenbach) as a means of distinguishing consonantal *U*. In words like 'queen' *u* itself is still employed consonantly. In modern Welsh *w* is a vowel with the value of Latin *u*, as well as a consonant (Pwllheli). This was at one time an English usage also (13th and 14th centuries). Such words as 'new' and 'how' still supply an analogy to it. It provides a much-needed addition to the weak representation of vowels in the Latin alphabet.

Waagen, GUSTAV FRIEDRICH (1794-1868), German art critic, born at Hamburg; came into prominence through the publication of his *Ueber Hubert und Johann van Eyck* (1822) and *Kunstwerke und Künstler in England und Paris* (1837-9), which was subsequently enlarged and republished in English as *The Treasures of Art in Great Britain* (1854-7), with a supplement, *Galleries and Cabinets of Art in Great Britain* (1857). His other works include *Kunstwerke und Künstler in Deutschland* (1843-5) and *Die vornehmsten Kunstdenkmäler in Wien* (1866-7). From 1830 he was keeper of prints in the Berlin Museum.

Waag-Neustadt, tn., Hungary, on the riv. Waag, 32 m. N.N.W. of Neutra. Pop. 5,300.

Wabash, tn., cap. of Wabash co., Indiana, U.S.A., on the Wabash, 40 m. s.w. of Fort Wayne; has railway workshops, bridge-

building and iron works, and manufactures of agricultural implements and of paper. Pop. (1910) 8,687.

Wabash, riv., United States, a right-hand branch of the Ohio, rises in N.W. of Ohio state and flows S.W. across Indiana, thence nearly S. along the W. boundary of that state to its junction with the Ohio near Shawneetown. The drainage area is 33,725 sq. m., and its total length 550 m. It is navigable to Lafayette, Indiana. The Wabash and Erie canal connects the river with Lake Erie.

Wace (fl. 1170), chronicler, born in Jersey (1100?); settled at Caen before 1136; received a prebend at Bayeux from Henry II. (1169?). His works were *Roman de Rou*, a poetical history of the Norman dukes, and *Brut*.

Wace, HENRY (1836), dean of Canterbury, was born at London; delivered the Boyle Lectures (1874-5); was Bampton lecturer (1879), and became professor of ecclesiastical history in King's College, London (1875). He was made a prebendary of St. Paul's, London (1881), and principal of King's College (1883). He was chaplain of Lincoln's Inn (1872-80), and preacher of Lincoln's Inn (1880-96). He belongs to the more liberal evangelical party. In conjunction with the late Sir William Smith, Wace was editor of the *Dictionary of Christian Biography* (1877-87); he has also published *The Bible and Modern Investigations* (1903), *The Principles of the Reformation* (1910), and *Prophecy: Jewish and Christian* (1911).

Wacht am Rhein ('Watch on the Rhine'), German national song, written (1840) by Max

Schneckenburger, composed in its popular form (1854) by Karl Wilhelm. It was the battle-song of the German army (1870-1).

Wächter, KARL GEORG VON (1797-1880), German jurist, born at Marbach on the Neckar. He was appointed rector of Tübingen University (1825), professor of law at Tübingen (1819) and at Leipzig (1833), professor and chancellor at Tübingen (1836), and professor of Roman law at Leipzig (1852). He was president of the Württemberg chamber (1839-49). His works include *Beiträge zur Deutschen Geschichte* (1845), *Gemeines Recht Deutschlands* (1844), and *Die bona Fides* (1871). See *Life*, in German, by Wächter (1881).

Waco, city, Texas, U.S.A., co. seat of McLennan co., on Brazos R., 95 m. N.N.E. of Austin; manufactures saddlery and harness, and has flour, woollen, planing, and cotton-seed oil mills, foundries, and machine shops. Pop. (1910) 26,425.

Wad, a hydrated manganese dioxide, occurring in brownish black, earthy masses.

Wadai, Mohammedan sultanate, in Central Sudan, Africa, E. of Lake Chad; area estimated at 170,000 sq. m., and population 2,000,000, chiefly Mabas. The s. and E. are fairly fertile; the N. is arid generally. Ivory and ostrich feathers are exported. Abeshr is the residence of the sultan. Wadai has been in the French sphere of influence since 1898, and under French protection since 1903.

Waddington, WILLIAM HENRY (1826-94), French ambassador, was born at St. Rémy, of English parents, and educated at Rugby and Trinity College, Cambridge. After travelling in Asia Minor (1850-62), he in 1865 was elected a member of the Académie of Inscriptions and Belles-Lettres. He was elected to the National As-

sembly in 1871, and in May 1873 was minister of public instruction in the Dufaure cabinet for seven days. Waddington was returned to the Senate in 1876, was again minister of education (1876-7), and then minister of foreign affairs (1877-9) in the government of Jules Simon. In July 1878 he proceeded as chief French plenipotentiary to the Berlin Congress. He became premier in February 1879, but resigned in the following December. He accepted the London embassy in July 1883, and until 1893 played a great part in maintaining friendly relations between Great Britain and France. His wife published *Letters of a Diplomat's Wife* (1903), and *Italian Letters* (1905).

Wade, GEORGE (1673-1748), British field-marshal. He served in the French war, and gained laurels at Almanza (1707), Saragossa (1710), and other battles; took part in suppressing the rebellion of 1715, in the expedition against Vigo (1719); was elected M.P. for Bath (1722). He constructed great military roads in Scotland (1726-40); was appointed field-marshal (1743), commanding the forces in Flanders against the French.

Wade, THOMAS (1805-75), English poet, born at Woodbridge, Suffolk. For a time he edited *Bell's Weekly Messenger* and then the *British Press*. He married the pianist Mrs. Lucy Bridgman. In 1825 Wade published *Tasso and other Poems*. His dramatic setting of Griselda's story, *Woman's Love, or the Triumph of Patience* (afterwards called *Duke Andrea*), was successfully played in 1828; but *The Jew of Arragon, or the Hebrew Queen* (1830) failed on the stage. A volume of miscellaneous poems—*Mundi et Cordis Carmina*—appeared in 1835. In 1839 appeared *Prothanasia*, a blank verse poem.

Wade produced in 1846 a version of Dante's *Inferno*, the first in the original metre. Several of his poems are included in Nicoll and Wise's *Literary Anecdotes of the Nineteenth Century* (1895).

Wade, SIR THOMAS FRANCIS (1818-95), British diplomatist, born in London. He was appointed to the missions of Lord Elgin (twice) and Sir F. Bruce (1857-60), and became minister plenipotentiary at Peking (1871). He was made K.C.B. (1875). He retired in 1883, and was appointed professor of Chinese at Cambridge (1888). Wade wrote *Notes on the Chinese Empire* (1850), *Yü-yen Tzu-erh Chi: A Progressive Course in Colloquial Chinese* (1867).

Wadebridge, urban dist., Cornwall, England, on the Camel, 7 m. N.W. of Bodmin. Granite and slate are mined and exported. Pop. (1911) 2,339.

Wadelai, tn., on l. bk. of Upper Nile, in the British Uganda Protectorate, 40 m. N. of the Albert Nyanza; was the centre of Emin Pasha's equatorial province prior to his relief by Stanley in 1889. It came under British influence in 1894.

Wädenswil, comm., Switzerland, canton of and 12 m. S.S.E. of Zürich, on the S.W. shore of the Lake of Zürich. Pop. (1910) 9,030.

Wadhwan, chief tn. of Wadhwan state, Kathiawar peninsula, Bombay, India, 66 m. S.W. of Ahmedabad. Industries—saddlery and manufacture of soap. Pop. 16,000. The state has an area of 237 sq. m. and a population of 40,000.

Wadi, WADY, or DONGA, a river-course which is only temporarily filled with running water. Wadis are found in arid areas.

Wading-birds. See GRALLATOIRES and BIRD.

Wad Medani, tn., Anglo-Egyptian Sudan, on the l. bk. of the Blue Nile, 110 m. S.E.

of Khartum. It was formerly a place of considerable importance. Pop. 20,000.

Wadowice, tn., Austria, in crownland of Galicia, 22 m. W.S.W. of Cracow. Pop. (1911) 7,454.

Wadset, an obsolete form of security over land in Scotland, created by conveying the land to the creditor or wadsetter, with the obligation to redeem the land on payment of a specified sum by the debtor or reverser. In proper wadset, the wadsetter takes the land in pledge, rents and profits going to the extinction of interest. In improper wadset, the wadsetter takes the rents, but must account for them after paying principal and interest.

Wadstena. See VADSTENA.

Wady. See WADI.

Wady Halfa, tn., Anglo-Egyptian Sudan, just below the second cataract, 570 m. S. of Cairo. Communication with Assuan is by steamer, and with Khartum by rail (575 m.). Pop. 3,000.

Wady Musa, modern name of Petra, N. Arabia, due to the tradition that the stream issuing through the gorge which defends the entrance to the city, set in a hollow of the Edomite mountains, was the one stricken from the rock by Moses (Num. 20: 7-13).

Waereghem, tn., W. Flanders prov., Belgium, 10 m. N.E. of Courtrai. Pop. 9,000.

Waesmunster, comm., E. Flanders prov., Belgium, 14 m. E. by N. of Ghent. Pop. 6,000.

Wafer, an adhesive disc for securing letters or sticking papers together. Common wafers are punched out of a paste made of very fine flour, which is pressed between two heated plates of smooth iron. Transparent wafers are made of isinglass or gelatin, dried upon plate glass, and punched out in various forms and sizes. The gummed envelope has

put wafers into disuse. For the liturgical use of the word, see **HOST**.

Wafflard, ALEXIS JACQUES MARIE (1787-1824), French dramatist, wrote most of his plays in collaboration with J. D. Fulgence de Bury, known as 'Fulgence.' The chief of these, which as a rule are satirical comedies of middle-class life, executed with considerable wit, are—*Un Moment d'Imprudence* (1819), *Un Voyage à Dieppe* (1821), *Les Deux Ménages* (1822), *Le Célibataire et l'Homme Marié* (1824). Of the plays written by himself alone the chief are—*Haydn* (1812), *Le Voile d'Angleterre* (1814), *Un Promenade à Saint-Cloud* (1817), *Un Jeu de Bourse* (1821), *L'Ecolier d'Oxford* (1824).

Wageningen, tn., Netherlands, prov. Gelderland, near r. bk. of Rhine, 11 m. w. of Arnhem, with an agricultural institute. Pop. (1911) 9,599.

Wager, a mutual contract by which each of two parties covenants to pay a sum to the other, the one in case of a future event happening, the other in case of its not happening. Wagers were made irrecoverable at law by the Gaming Act (1845), which was extended by the Gaming Act (1892) to the case of money paid by a third party at the request of the loser.

Wager, SIR CHARLES (1666-1743), British admiral. In 1708, when in the W. Indies, he fell in with a Spanish treasure fleet off Cartagena, and captured one ship heavily laden with treasure, but unfortunately sank the far richer ship of the Spanish admiral. He was appointed a lord of the Admiralty in 1718. In 1731 he was made an admiral, and in 1733 was appointed first lord. In 1742 he obtained the post of treasurer of the navy.

Wager of Battle. See **BATTLE, TRIAL BY**.

Wager of Law. In England formerly the defendant in an action to obtain specific restitution of goods wrongfully detained might discharge himself from the claim by wagering his law—that is to say, he came into court and swore to his innocence, and brought eleven of his neighbours (oath-helpers or compurgators) to swear that they believed his denial to be true. As this defence was not open in an action of trover, that form of action practically superseded the action of detinue. Wager of law was abolished by statute in 1833.

Wages, the term used to denote the reward or remuneration of labour. Wages may be paid by time or by piece, or by a combination of the two. The chief objection to time wages is that they may encourage idleness, and the main drawback of piece wages is considered to be a temptation to scamping. In industries where the quality of the work is important time wages are generally preferred. With a minimum payment, fixed by agreement, a bonus may sometimes be given in addition, proportioned to the quantity or quality of the work performed, and such wages have been distinguished as 'progressive wages.' The general rate of wages in a country, like the particular rates in special industries, is determined by forces operating on supply and demand. At one time the 'wages-fund' doctrine, as it was called, occupied a large place in economic discussion. It maintained that a certain sum was set aside for the payment of wages in a country, and that they could only be altered by increasing this sum, which was possible by a gradual process alone, or by diminishing the number of the labourers among whom it was divided. At any particular moment the sum to be spent in wages was predetermined.

Wages accordingly became a question of the relation between the capital devoted to the payment of labour and the numbers of the population. The wages-fund theory has been generally discarded. Now, by contrast, wages are represented as a 'flow' rather than a 'fund.' The product, which is being continually created, and may be affected by the efficiency of the labourers themselves, fixes the amount which can and will be paid. It is true that wages may often be advanced from capital. It is certain that the general structure of business, and the existing distribution of capital between different objects, have an important bearing on the possibilities of employing labour, and that such conditions can only be slowly altered. It is also true that the standard of comfort recognized by the labourers, below which they will hesitate to marry, does not fail to influence the numbers of the people, and to affect the competition for employment. Wages depend on the demand for labour, and on its supply. The total amount of wealth produced, which itself is affected, among other causes, by the efficiency of labour, sets the maximum limit. The division of this 'national dividend,' as it has been called, between the several agents of production is determined by the urgency with which each requires the services of the others. The demand for labour, accordingly, depends on the need the other agents feel for its services, and on its relative scarcity or comparative abundance. The growth of population is not unimportant; but the action of public opinion, the protection of the law, and the combination of the workers themselves in a trade union, may be equally important. In the case of the bankruptcy of the master, four months' salaries

of clerks and servants up to £50, and two months' wages of labourers or workmen up to £25, are paid in priority to all other claims. An infant can maintain a claim for wages up to £50 in the county court. By the Wages Attachment Abolition Act, 1870, the wages of any servant, labourer, or workman cannot be attached for debt, while by the corresponding Scottish Act (33 and 34 Vict. c. 63), similar protection is given, except as regards any surplus over 20s. per week.

The wages of masters and seamen accrue from day to day, are no longer subject to the earning of freight, and give rise to a maritime lien. Under £50, they should be recovered in a court of summary jurisdiction, except where the owner is bankrupt, or the ship under arrest.

Wages are specially handled in F. A. Walker's *The Wages Question* (new ed. 1906). W. T. Thornton's *On Labour* (ed. 1870), and F. D. Longe, in his *Criticism of Mill's Theory of Wages*, assailed the wages-fund doctrine so successfully that J. S. Mill himself (*Dissertations and Discussions*, vol. iv.) abandoned the theory. F. W. Taussig, in *Wages and Capital* (1896), has carefully re-examined the theory. D. F. Schloss's *Methods of Industrial Remuneration* (new ed. 1898) supplies an exhaustive account and detailed criticism of different species of wages. Mr. and Mrs. Webb's *Industrial Democracy* (new ed. 1902) states and examines the attitude and action of trade unions. See also Ashley's *Adjustment of Wages* (1903), Bowley's *Wages in the United Kingdom in the Nineteenth Century* (1900), Brassey's *Work and Wages* (1908), Davidson's *Bargain Theory of Wages* (1898), St. Clair's *Low Wages* (1908), Schoenhof's *Economy of High Wages* (1892), Thompson's *Theory of Wages*

(1892), and Shield Nicholson's *Effects of Machinery on Wages* (1892).

Wagga-Wagga, tn., co. Wynyard, New South Wales, on l. bk. of Murrumbidgee, 73 m. N. of Albury. It is the centre of trade for a large surrounding district, which produces gold, tobacco, wine, and cereals. Pop. 5,500.

Wagner, ADOLF (1835), German political economist, born at Erlangen; was appointed professor of political economy at Dorpat (1865), at Freiburg (1868), and at Berlin (1870). He is the author of *Beiträge zur Lehre von den Banken* (1857), *Die Geld- und Kredit-theorie der Peelschen Bankakte* (1862), *Die Ordnung des Oesterreichischen Staatshaushalts* (1863), *Finanzwissenschaft* (1883-9), and *Handbuch der Politischen Oekonomie* (4th ed. 1896).

Wagner, RUDOLF (1805-64), German physiologist and anatomist, born at Bayreuth; went to Paris to study under Cuvier; became professor of zoology at Erlangen (1833), and in 1840 succeeded Blumenbach in the chair of physiology at Göttingen. He wrote a *Handwörterbuch der Physiologie* (4 vols. 1842-53), *System of Physiology* (Eng. trans. 1844), and *Comparative Anatomy* (Eng. trans. 1845). He was also a leading advocate of scientific spiritualism, his principal book in this field being *Der Kampf um die Seele* (1857).

Wagner, SIEGFRIED (1869), German musical composer, son of Wilhelm Richard Wagner; studied composition under Humperdinck, and has produced several operas, notably *Der Bühnhäuter* and *Herzog Wildfang*, both of which were first performed in Munich.

Wagner, WILHELM RICHARD (1813-83), German musical composer and litterateur, was born in Leipzig. From 1833-9 he held

appointments as conductor in Würzburg, Magdeburg, Königsberg, and Riga, and during this period composed amongst other works the operas *Die Feen*, *Das Liebesverbot*, and Acts 1 and 2 of *Rienzi*. In 1839 he proceeded to Paris. Here his hopes that his opera *Rienzi* would be produced were not fulfilled. Wagner, whilst slaving at literary and musical hack work to procure the necessities of life, finished the music to *Rienzi*, and composed his *Faust* overture and *The Flying Dutchman*. In 1842 he left Paris for Dresden, where he had secured the acceptance of *Rienzi*. The successful production of this work was followed a few months later by that of *The Flying Dutchman*, and soon afterwards he received the appointment of musical director. While in Dresden he composed *Tannhäuser* (produced there in 1845), *Lohengrin* (finished in 1848; produced by Liszt in Weimar, 1850), and also made some progress with the 'book' of *Der Ring des Nibelungen*. In 1849, owing to his participation in the revolutionary (constitutional) movements, he had to flee the country, and it was not until 1862 that he returned to Saxony. Whilst in exile at Zürich he composed portions of *Das Rheingold*, *Die Walküre*, *Siegfried*, and *Tristan und Isolde*. In 1855 he acted as conductor at the London Philharmonic Society's concerts. The summer of 1861 was passed in Vienna, where he for the first time heard *Lohengrin* performed; but his efforts to secure the production of *Tristan* were unsuccessful. In 1864 he was granted a pension by Ludwig I. of Bavaria, and after a year in Munich he removed to Tribschen, near Lucerne. Here he finished (1867) the *Meistersinger* (a serio-comic opera) and *Siegfried* (1869), and began

(1870) the music of *Götterdämmerung*. In 1870 he married for his second wife Cosima, a daughter of Liszt, and formerly the wife of Von Bülow. In 1872 he settled finally in Bayreuth, where in the same year a theatre was begun expressly for the production of his operas. The inauguration (1876) of this theatre was celebrated by the first performance in its entirety of the *Nibelungen Ring*, or tetralogy, of which the individual parts—*Rheingold* (the introduction), *Walküre*, *Siegfried*, and *Götterdämmerung*—are each of about the dimensions of a complete opera. *Parsifal*, his last and perhaps greatest work, was produced at Bayreuth in 1882. It was not until he was nearing manhood that Wagner began the serious study of music. On hearing Beethoven's symphonies he was inspired with the idea that, were such glorious music united to suitable language, musical drama could be made one of the greatest intellectual forces in existence. He was his own librettist and stage manager, and the literary excellence of his librettos and his skilful management of scenic effects were scarcely less remarkable than his technical equipment as a musician. His first important work, *Rienzi*, was composed in the style of French grand opera; but in his ultimate creation of what he conceived to be the perfect form of musical drama he entirely discarded all previous rules and limitations. Wagner abandoned all set forms, believing with Peri and Caccini, the founders of modern opera, that a series of definite musical movements impeded the action of the drama. Further, he assigned an equal degree of importance to poetry, music, and scenery, and he was also the first to make the *leitmotif* an outstanding feature in operatic works. His music is

strikingly original, and he was a supreme master of instrumentation. His literary works, a number of which have been translated into English, are published in ten volumes (1871-83; new ed. 1888). Perhaps the best *Life* is Jullien's (1886). See also *Lives*, in German, by Glase-napp (1882-1903; Eng. trans. by W. A. Ellis, 5 vols. 1900-1906), Pohl (1883), Tappert (1883), and Wolzogen (1883); Praeger's *Wagner as I Knew Him* (1892), Hueffer's *Richard Wagner and the Music of the Future* (1874), *Correspondence between Wagner and Liszt* (Eng. trans. 1888), *Wagner's Letters to Dresden Friends* (Eng. trans. 1890), *R. Wagner's Briefe* (ed. by Altmann, 1905), *Gedichte von Richard Wagner* (ed. by C. F. Glasenapp, 1906), *Richard to Minna Wagner: Letters to his First Wife* (trans. by W. A. Ellis, 1909), Judith Gautier's *Wagner at Home* (Eng. trans. 1910), *Family Letters of Richard Wagner* (trans. by W. A. Ellis, 1911), and *My Life*, by Richard Wagner (1911). He was at one time a friend of Nietzsche, but they quarrelled, and the latter wrote *The Case against Wagner* (Eng. trans. 1910).

Wagram, vil., Lower Austria, 12 m. N.E. of Vienna; was the scene of the defeat of the Austrians under Archduke Charles by Napoleon (July 5 and 6, 1809).

Wagtail (*Motacilla*), a genus of insectivorous passerine birds, related to the pipits. The wag-tails and the pipits together constitute the family Motacillidae, whose members are chiefly found in the Old World. The wagtails are distinguished by their long tails, the bright colours of their plumage, and their migratory habits. They are found either near water or in meadows, and seek their food upon the ground. They run swiftly, the movements of the tail during running giving

rise to the popular name. Both bill and feet are slender. Five species occur in Britain. The commonest are the white wagtail (*M. alba*) and the pied form (*M. lugubris*), which are said to interbreed. Others are the gray (*M. melanope*), the blue-headed (*M. flava*), and the yellow wagtail (*M. Rayi*). There are about twenty-five other species, several of which are African.

Wahabis, a sect of Mohammedans, founded about the middle of the 18th century by one Mohammed Abdul Wahab, in Nejd in Arabia. He proclaimed anew the sovereign validity of the original Koran; denounced traditional glosses, saint worship, and pilgrimages (except that to the Kaaba at Mecca); condemned luxury in dress and living; and prohibited the use of wine and tobacco. The youthful prophet was driven from city to city until he found an asylum with an Arab chief named Mohammed Ibn Sa'ud. A puritan crusade was then undertaken, which was crowned by the conquest of Medina, and resulted in the establishment of a militant church, at issue both with the infidel and with other forms of Islam. After a conflict of nearly thirty years, Ibrahim Pasha of Egypt succeeded, in 1818, in crushing the temporal power of the Wahabis in Arabia. In 1831, Wahabi warriors in India suffered defeat at the hands of the Sikhs. The Wahabis are still found in Arabia, Upper and Lower Egypt, India, and Turkey.

Wahsatch Mts., a rugged mountain mass in Utah, U.S.A., running N. and S., and forming the E. wall of the Great Basin. Mount Nebo, one of the chief peaks, reaches 11,680 ft. One of the spurs, the Uintah Mts., runs along the N.E. boundary, and contains Gilbert Peak (13,687 ft.).

Wai, tn., on Krishna R., Satara dist., Bombay Presidency, India, 39 m. S. of Poona. It is a sacred place and a pilgrim resort, and contains several Hindu temples. Pop. 14,000.

Waiblingen, tn., Württemberg, Germany, on the Rems, 8 m. N.E. of Stuttgart. The name of Ghibellines, which was used in Italy for the adherents of the Hohenstaufen emperors, is generally considered to have been derived from the name of this town. Pop. (1910) 6,977.

Waif. (1.) Waifs are goods thrown away by a thief in his flight. They used to belong to the crown, or the lord of the manor, if the crown or the lord could seize them; but if the owner prosecuted the thief to conviction, he could recover his goods if he claimed them within a year. Now, if goods are stolen and the offender prosecuted to conviction, the property in the goods reverts in the owner. (Larceny Act, 1861, s. 100; and Sale of Goods Act, 1893, s. 24.) (2.) By the common law of England a woman could not be outlawed, but she could be waived or declared a waif. See also ESTRAYS.

Waihi, tn., New Zealand, in Piako co., North I., 32 m. S.S.E. of Thames; has gold mining. Pop. 5,600.

Waikato, riv., New Zealand, 200 m. long, rises on slopes of Mount Ruapehu in North Island, and flows through Lake Taupo, 4 m. below which it precipitates itself over the Huka Falls (30 ft. high). After flowing N.W. for the main part of its course, it makes a sharp turn to the W., and discharges into the N. Taranaki Bight. It is navigable for river steamers for 75 m. from its mouth.

Wainewright, THOMAS GRIFFITHS (1794-1852), English writer and poisoner, born at Chiswick. He studied art, and exhibited at the Royal Academy (1821-5).

Some Passages in the Life of Egmont Bonmot appeared in 1827. Wainwright poisoned his uncle (1829) for his property, and his sister-in-law (1830) for her insurance, his mother-in-law sharing the same fate (1830). In 1837 he was transported for life for a forgery committed in 1826.

Wainfleet, par. and mrkt. tn., Lincolnshire, England, 18 m. N.E. of Boston. The grammar school was founded in 1484 by William of Waynflete (Bishop Patten), who was a native. Pop. (1911) reg. dist. 4,673.

Waits, street musicians, now heard only at Christmastide, but formerly, especially in the 17th century, an established institution, wearing 'waits badges' with the town arms. Those of Exeter existed as early as 1400. Their instruments (hautbois) were also styled 'waits,' and the same title was extended to the night guard of the city of London.

Waitz, GEORG (1813-86), German historian, born at Flensburg, Schleswig. He was a pupil of Ranke. In 1842 he became professor at Kiel. In 1849 he accepted a chair at Göttingen, and there formed a school of historians, becoming (1875) member of the Berlin Academy, and director of *Monumenta Germaniæ Historica*. His works include *Deutsche Verfassungsgeschichte* (8 vols. 1844-78); *Schleswig-Holsteins Geschichte* (1851-4); *Lübeck unter Jürgen Wullenweber*, a statesman of the Hanseatic League (1855-6); *Ueber das Leben und die Lehre des Ulfrics* (1840); *Das alte Recht der salischen Franken* (1846); *Deutsche Kaiser von Karl dem Grossen bis Maximilian* (1862). See *Studies* by Steindorff (1886) and Kluckhohn (1887).

Waizen, the German name of Vaz.

Waiver. A person may, by express words, waive or abandon his legal rights, or he may be

held to have done so by his conduct. For example, if a new contract is made about the subject matter of an old contract, a breach of the old contract will be waived; and in legal proceedings a person will be held to waive irregularity if he does not immediately take objection to it. But a man must know what his rights are before he can be held to have waived them.

Wakamatsu, tn., Japan, in Hondo I., 120 m. N. of Tokyo; has a large government foundry turning out pig-iron, steel, rails, and plates. Pop. 40,000.

Wakayama, maritime tn. in Hondo I., Japan, 60 m. s.w. of Osaka; has an important trade in cotton. Pop. (1908) 77,303.

Wake, a festival formerly held in parishes on the anniversary of the dedication of a church to some saint (called in Ireland 'patron day'), attended by merriment, and generally fallen into disrepute or disuse. A similar watching over a dead body, termed 'lyke' or 'lych-wake,' once common in the Highlands of Scotland and in Ireland, has also passed, or is passing, away as a custom.

Wakefield. (1.) Municipal and parl. bor. and city, W. Riding, Yorks, England, on the Calder, 9 m. S.E. of Leeds. The cathedral is mainly 15th century, and has a spire 245 ft. in height. On a bridge over the Calder is a chapel founded by Edward IV. Manufactures include worsted yarn, cocoa-matting, chemicals, soap, agricultural implements, flour, and beer. There is a large corn market. Coal is mined in the vicinity. The battle of Wakefield was fought in 1460, when the Yorkists were defeated by the Lancastrians. A county hall was opened in 1898. Pop. (1911) 51,516. (2.) Town, Middlesex co., N.E. Massachusetts, U.S.A., 10 m. N. of Boston; has manufactures of

stoves, shoes, and rattan. Pop. (1910) 11,404.

Wakefield, EDWARD GIBBON (1796 - 1862), British colonial statesman, born in London. In 1831 he went to Australia to study the problem of transportation on the spot, and developed a plan of systematic colonization. The fundamental idea of his plan was that the unoccupied lands of a new colony should not be granted promiscuously, but should be portioned out and sold on a regular system at an adequate price. Wakefield accompanied Lord Durham to Canada as a secretary, and remained in that colony till 1845. He afterwards settled in New Zealand, where he died. His chief work is *A View of the Art of Colonization* (1849).

Wakefield, GILBERT (1756-1801), English controversial writer, was born at Nottingham. He developed Unitarian opinions, and seceded from the Church of England. He was imprisoned for two years (1799-1801) at Dorchester for a libel against Bishop Watson, and was treated as a martyr by his friends, who collected £5,000 for him. He was a somewhat copious author of the keenly controversial type. He wrote his own *Memoirs* (1792); and his correspondence with Fox (1813) contains much that is interesting.

Wakefield Mystery. See TOWNELEY MYSTERIES and MIRACLE PLAY.

Wake-Robin, a popular name for *Arum maculatum*, the cuckoo-pint. See ARUM.

Wakley, THOMAS. See LANCET.

Walachia. See WALLACHIA.

Walajapet, munic. tn., N. Arcot dist., Madras Presidency, India, 19 m. E. of Vellore, with silk and cotton weaving, dyeing and carpet-making. Pop. 10,000.

Walata, or BIRU, an oasis in the W. Sahara, Africa, about 250

m. N.W. of Timbuktu; has an extensive native trade.

Walch, CHRISTIAN WILHELM FRANZ (1726-84), German theologian, was born at Jena. He was professor of theology at Göttingen in 1757. As an ecclesiastical historian his contributions to literature are of solid worth—*Gedanken von der Geschichte der Glaubenslehre* (1756); *Entwurf einer Histoire der Ketzereien, bis auf die Reformation* (11 vols. 1762-85); and *Neueste Religionsgeschichte* (9 vols. 1771-83).

Walch, JOHANN GEORG (1693-1770), German theologian, was father of the above. He was professor of theology at Jena, where he edited the works of Luther in 24 vols. (1740-52), and also drew up a history of the religious questions which had occasioned disputes within the Evangelical-Lutheran Church (5 vols. 1730-9). This was followed by a work in 5 vols. on various controversies outside that church.

Walcheren, isl., Zeeland prov., Holland, between mouths of E. and W. Scheldt, covers an area of 52,000 acres, and is fertile, but somewhat unhealthy. Flushing and Middelburg are the chief places.

Walcheren Expedition was intended, as a diversion in favour of Austria, to destroy the French fleet in the Scheldt and capture Antwerp, which Napoleon was making a great arsenal. An army of some 40,000 men, under Chatham, Pitt's eldest brother, and a fleet under Sir Richard Strachan, left Portsmouth in the end of July 1809. Antwerp, which was weakly held, was reinforced by Bernadotte and King Louis Bonaparte, whilst Chatham took Flushing (Aug. 15) and occupied Walcheren, South Beveland, and Schouwen. Of the troops landed on fever-stricken Walcheren, some 7,000 died, and 15,000 were disabled; and the partial dis-

mantlement of Flushing, evacuated December 23, after the treaty of Schönbrunn, was the only result obtained for twenty millions of money. Castlereagh is usually blamed for this failure, but his only mistake was the choice of the incompetent Chatham as leader, who could have achieved a brilliant success had he obeyed orders and acted promptly. See *Political History of England*, vol. xi. ch. iii., etc. (1906).

Walckendar, CHARLES ATHANASE, BARON (1771-1852), French geographer and man of letters, born in Paris; was prefect of Nièvre (1826-38), and secretary of the Academy of Inscriptions (1840). He wrote biographies of *La Fontaine* (1820), *Horace* (1840), and the *Marquise de Sévigné* (5 vols. 1842-52); *Cosmologie* (1815); *Le Monde Maritime* (4 vols. 1818); *Recherche sur la Géographie Ancienne et celle du Moyen-Age* (1822-3); *Nouvelle Collection des Relations de Voyages par Terre et par Mer* (21 vols. 1826-31); *Géographie Ancienne des Gaules* (3 vols. 1839).

Wald. (1.) Town, Rhenish Prussia, in dist. of Düsseldorf, 7 m. s. by w. of Elberfeld. It has manufactures of iron, steel, etc. Pop. (1910) 25,311. (2.) Commune, Switzerland, canton of and 19 m. E.S.E. of Zürich. Pop. (1910) 7,318.

Waldbroel, vil., Rhenish Prussia, 30 m. E. by s. of Cologne. Pop. (1910) 6,920.

Waldeck, or WALDECK-PYRMONT, principality of German empire, consists of two principalities—Waldeck, lying between the Prussian provinces of Westphalia and Hesse-Nassau; and Pyrmont, farther to the N.E., between Westphalia, Hanover, the duchy of Brunswick, and the principality of Lippe. The former lies on the watershed between the Rhine and the Weser at altitudes from 2,775 ft. (Hegekopf)

to 1,970 ft.; Pyrmont is almost coincident with the valley of the Emmer, a tributary of the Weser. United area, 433 sq. m.; pop. (1910) 61,723, almost all Protestants. More than 38 per cent. of the surface is covered with forests. Iron is mined. There are mineral springs at Pyrmont and Wildungen. Cap. Arolsen. The principality has one vote in the Imperial Federal Council, and sends one representative to the Imperial Diet. The two principalities were first united in the 13th century. In 1867 the prince resigned most of his sovereign rights to the king of Prussia.

Waldeck-Rousseau, PIERRE MARIE RENÉ (1846-1904), French politician, was born at Nantes. In 1879-89 he represented Rennes in the Chamber of Deputies. In 1881 he was made minister of the interior, in Gambetta's cabinet, which post he also held in Jules Ferry's cabinet (1883-5). As member of the Paris bar he defended De Lesseps in the Panama case in 1893. He was a senator in 1894, and in 1899 he formed a coalition cabinet to meet the difficulties attending the rehabilitation of Dreyfus. He resigned in June, 1902, having, by his moderation and firmness done much to restore confidence in republican institutions and respect for lawfully constituted authority. He published *Discours Parlementaires* (1889), *Associations et Congrégations* (1901), *Questions Sociales* (1900), *La Défense Républicaine* (1902), *Politique Française et Étrangère* (1903); and *Action Républicaine et Sociale* (1903).

Waldemar I., THE GREAT (1131-82), king of Denmark (1157). Aided by his great minister, Archbishop Absalon, he raised his kingdom to a high degree of prosperity. Having formed a league against the Wends with Henry the Lion, duke of Saxony, he conquered the island of Rügen

(1168-9). He was exceedingly popular with his people, especially with the peasantry.

Waldemar II., THE CONQUEROR (1170-1241), king of Denmark, youngest son of Waldemar the Great, ascended the throne in 1202. His attempts to reduce Sweden and Norway were unsuccessful; but in Germany he acquired Holstein and Mecklenburg, and in 1219 undertook a crusade against the Esthonians, whom he routed at the battle of Arvel, on which occasion the Danish national standard, the Danebrog, is said to have fallen down from heaven in response to the prayers of the Danish bishops. Yet when Waldemar was treacherously seized by Count Henry of Schwerin, and imprisoned for two years, the German princes at once revolted against Waldemar, and defeated him, after his release, at Bornhövede (July 22, 1227). The rest of his reign was devoted to legislation and internal reforms. It was by his order that the code known as *Jydske Lov* (1241), was drawn up.

Waldemar IV., called **ATTERDAG** (d. 1375), king of Denmark, succeeded to the throne in 1340. He sold Esthonia in 1346 to the Teutonic Order, and in 1360 he succeeded in regaining Scania, Halland, and Blekinge from the Swedish king. In 1361 he conquered Gotland, returning to Denmark with the incalculable treasures of Wisby; but this expedition involved him in two ruinous wars with the Hanseatic League and their allies, Sweden and Mecklenburg, during the second of which (1369) his enemies burnt Copenhagen. Peace was finally made at Stralsund (1370).

Waldenburg, tn., Prussia, in Silesia, on the Polesnitz, 42 m. s.w. of Breslau. It manufactures porcelain, stoneware, fire bricks, etc. There are coal mines in the district. Pop. (1910) 16,433.

Waldenses, or **VAUDOIS**, a religious community, whose foundation is attributed, on sound historical grounds, to Peter Waldo, a wealthy merchant of Lyons, who in 1170 renounced his possessions and began to wander about as a preacher of voluntary poverty; though certain apologists, in their zeal for the so-called historical continuity of Protestantism from the earliest times, have attempted to trace back the origin of the Waldenses to a period long anterior to the time of Peter Waldo. These claims have, however, been proved to be untenable (see Maitland's *Facts and Documents of the Waldenses*, 1862). After a time the followers of Peter Waldo, known as the 'poor men of Lyons,' established themselves in the valleys of the Cottian Alps, principally on the Italian side, in the valleys of La Pellice, Angrogna, and Chisone, but also in those of Provence and Dauphiné. Their proselytizing zeal, no less than their denunciation of the Church of Rome, their appeal to Scripture instead of the pope, their rejection (at any rate at first) of a definite priestly order, and permission to laymen to administer the Lord's Supper—all these things rendered them particularly obnoxious to the papal see. Pope Lucius III. excommunicated them in 1184, and Pope Innocent III. in 1215, and many perished in the persecution of the Albigenses (1209-29). Nevertheless they continued to increase, and carried their practice and profession all over the south of France, and far into the west and south of Germany. They were cruelly persecuted at Strassburg in 1212, at Bingen on the Rhine in 1392, and in the Piedmontese valleys in the times of Popes John XXII. (1316-34), Urban V. (1362-70), and Gregory XI. (1370-8). A war of extermina-

tion was begun against them by the Duchess of Savoy in 1475, and in 1487 Pope Innocent VIII. proclaimed a regular crusade against them. In Provence too they were mercilessly persecuted by the French in 1545. Nevertheless they stubbornly held their ground, and in 1561 extorted from the Duke of Savoy the right to freedom of worship in certain of the Piedmontese valleys; and ten years later they formed a 'union of valleys' to safeguard the rights thus extorted. In the following century, however, they suffered fearfully—first from a plague, which in 1630-1 carried off nearly one-half of them; secondly, from the French troops, aided by the Irish Brigade, who in 1655 inflicted upon them such barbarities that the religious consciousness of Europe was aroused and Cromwell intervened, while Milton thundered against their persecutors; and thirdly, from the Duke of Savoy, who in 1686 attempted their forcible conversion to Roman Catholicism, and exiled to Geneva those who proved obdurate. Three years later, however, a heroic band, pining for their native valleys, forced their way back to them under the leadership of their pastor, Henri Arnaud, and successfully withstood the French and Savoyard attempts to crush, convert, or remove them. From the reign of Queen Anne until the annexation of their country to the French republic, the English government paid them an annual subsidy. In 1827 Colonel Beckwith, an English officer mutilated at Waterloo, settled amongst them, married a Waldensian peasant girl, founded over a hundred schools, and remained there until his death (1862). In 1848 Charles Albert of Savoy granted them full religious and political rights. See Gilly's *Visit to the Valleys of*

Piedmont (1823), Comba's *History of the Vaudois in Italy* (Eng. trans. 1889), Preger's *Beiträge zur Geschichte der Waldesier* (1875), and Worsfold's *Valley of Light* (1899).

Waldersee, ALFRED, COUNT VON (1832-1904), Prussian field-marshal, born at Potsdam. He served on the general staff in the Bohemian campaign against Austria (1866); was chief of the general staff of Prince Frederick Charles and the Grand-duke of Mecklenburg during the Franco-German war of 1870-1; succeeded Moltke as chief of the general staff of the German army; was made field-marshal (1896); and was appointed commander-in-chief of the international forces engaged in the suppression of the Boxer insurrection in China (1900).

Waldheim, tn., Saxony, Germany, 34 m. S.E. of Leipzig. It manufactures cigars, furniture, and cloth. Pop. (1910) 12,353.

Waldkirch, tn., Baden, Germany, in a valley of the Black Forest, 9 m. N.E. of Freiburg. It manufactures textiles. Pop. (1910) 5,428.

Waldo. See WALDENSES.

Waldsassen, mrkt. tn., Bavaria, Germany, in the Upper Palatinate, 34 m. E. by N. of Bayreuth. It manufactures porcelain, pottery, and glass, and has iron mines, foundries, and mineral springs. Pop. (1910) 5,044.

Waldseemüller, or WALTZEMÜLLER, MARTIN, in Latin HYLACOMYLUS (1470-1513), German geographer and cartographer, born at Freiburg; spent nearly all his life in Alsace. His best-known work is *Cosmographiæ Introductio . . . in super quatuor Americi Vespucci Navigationis* (1507), in which the New World is for the first time designated *Americi Terra vel America*, although he afterwards acknowledged that America had been

discovered by Columbus. See D'Avizac's *Martin Hylacomylus Waldseemüller, ses Ouvrages et ses Collaborateurs* (1867); *Oldest Map with the Name America of the Year 1507, and the Carta Marina of the Year 1516*, edited by Fisher and Waiser (1903).

Waldstein, CHARLES (1856), American writer on art and archaeology, born in New York. He became lecturer in classical archaeology in Cambridge, England (1880); director of the Fitzwilliam Museum there (1883-9); director of the American Archaeological School at Athens (1889-93). He made excavations at Platea, Eretria, and Argos, and was Slade professor of fine art at Cambridge (1895-1901, and 1904). He has written *Essays on the Art of Phidias* (1885), *The Work of John Ruskin* (1894), *The Jewish Question* (1899), *The Argive Heraeum* (1902), *Art in the Nineteenth Century* (1903), and *Herculeanum, Past, Present, and Future* (1908).

Wales. *Geography.* — See ENGLAND AND WALES.

History.—The traces of Paleolithic man in Wales are extremely uncertain, but there are numerous remains of the Neolithic Period, especially the dolmens or cromlechs, now regarded by archaeologists as the stony frameworks of ancient tombs from which the earth has been washed away. These are chiefly found in Anglesey, Carnarvonshire, Pembrokeshire, and Brecknockshire. Stone implements of the Neolithic Period have also been found. The Bronze Age is represented by numerous specimens of isolated bronze implements and by a few bronze hoards, as well as by cairns and tumuli, containing urns with burnt bones, and sometimes bronze weapons. Formerly the fortresses of unmortared stone found on some of the Welsh mountains were re-

ferred to the Bronze Period, but owing to the discovery of pieces of iron and of late pre-Roman beads on their original floors (as at Treceiri in Carnarvonshire), archaeologists refer them to the Late Celtic period, about the beginning of the Christian era.

The earliest inhabitants of Wales, who are still largely represented in the present population, especially in S.E. Wales, were probably dark, short, and dolichocephalic. In the Bronze Period these were conquered by a tall, fair, and brachycephalic race, which spoke the parent speech of the Goidelic varieties of the Celtic Indo-European tongue. The stream of immigration from the Continent, which began at about 1500 or 1000 B.C., probably never ceased. Gaul came to be occupied by tribes speaking dialects of Celtic different from those of the older settlers; the speech of the continental immigrants into Britain also became modified into that form of Celtic which is the parent. One of the peculiarities of this parent speech was the change of Indo-European *qu* into *p*. About a century and a half before our era a powerful army of these later Celts from Belgic Gaul, armed with iron weapons and chariots, invaded Britain, and introduced the typical Late Celtic civilization and art. The Romans conquered Wales under Ostorius Scapula, Suetonius, and Agricola. The last named, according to his son-in-law Tacitus, induced the Britons to make great headway in Roman civilization. Legions were posted to guard the Welsh frontier at Deva (Chester), Uriconium (Wroxeter, near Shrewsbury), and Isca Silurum (Caerleon-on-Usk). After the firm establishment of Roman rule, in the 1st century A.D., Wales appears to have given the Romans little trouble.

In the 5th century A.D. Cun-

edda Wledig, from the neighbourhood of Edinburgh, settled in Wales, probably by the invitation of the Welsh chieftains, in order to repel the Irish piratical invaders, and it is from his stock that most of the subsequent rulers of Wales were descended. Many of his descendants, too, became prominent in the ancient British Church, and St. David (Dewi Sant), the patron saint of Wales, was of his family. In the struggle between the Britons and the English one of the chief heroes was Arthur. The name Cymry, by which the Welsh people call themselves, is derived from an older *Combroges*, meaning men of the same country, and appears to have been adopted by the tribes which held out longest against the English on the west. In 577, by their defeat at Deorham, near Bath, the Welsh were divided from their kinsmen of S.W. Britain; and about 613, by their defeat at Chester, they were separated from the men of Cumbria and Strathclyde. Christianity of the monastic type developed rapidly in Wales in the 5th and 6th centuries, in close conjunction with the churches of Ireland and Brittany. Wales greatly suffered from the ravages of the Danes, but much of her power was restored by Rhodri Mawr (844). The movement, stimulated in W. Europe towards the codification of laws and customs by Charlemagne, led to the formation of the Code of Hywel Dda (for the Good), who died in 949. The next Welsh prince of distinction is Gruffudd ab Llywelyn (d. 1063), a contemporary and opponent of the English king Harold. The succeeding period is chiefly memorable for a long and fierce struggle between the Welsh chieftains, notably of Gwynedd or N. Wales and the Norman barons, who were sometimes

aided by the crown. Occasionally, however, the barons were helped, as in the reign of King John, by the Welsh chieftains against the king. The Normans first appeared in Wales, in Glamorganshire, in 1072. The family which ruled in Gwynedd at this time was that of Gruffudd ap Cynan, one of whose descendants, Llywelyn ab Iorwerth (1173-1240), aided the barons in wresting the great charter from King John. Llywelyn ab Gruffudd, his grandson, espoused the cause of Simon de Montfort. It was the support given by the Welsh princes to the barons that led Edward I. to make a complete conquest of the principality of Wales, thereby consolidating the power of the crown. Prince Llywelyn was killed at Aberedw, near Builth on the Wye, in 1282, and his brother David was executed for high treason in the following year. Edward rendered his conquest of Wales effective by means of a series of magnificent castles, notably those of Conway, Carnarvon, and Harlech. The boroughs of Wales, where English law prevailed, now tended to come into conflict with the men of the country, where Welsh law, with some modifications, was still in force. The friction between the boroughs and the county districts came to a head in the beginning of the 15th century, in the revolt of Owen Glendower, who for a time was practically king of Wales, and was an ally of France. In the wars of the Roses Welshmen played a prominent part on both sides. East Wales was mainly Yorkist, and the west Lancastrian. Finally, after some hesitation, Wales rallied round the Earl of Richmond. Henry VII. took steps to place the boroughs of Wales and the county districts on the same footing by placing them all under English law. Moreover,

the institution of the Court of the Star Chamber made the administration of justice a reality. After the accession of Henry VII. the Welsh became devoted adherents of the British crown, and continued so even during the civil war. The development of good government produced the sturdy and independent middle class, which steadily grew in strength, and which is the backbone of Wales to-day. It is the growth of this middle class that has mainly resulted in the great educational movements of modern Wales in university and higher education, as well as in local self-government generally. In 1895 Mr. Asquith, when home secretary in Mr. Gladstone's last administration, introduced a bill for the disestablishment of the church in Wales. It passed the second reading, and was in the committee stage when Parliament was dissolved. He again introduced a similar bill in 1909, but it was withdrawn under a promise to reintroduce it at an early date. In 1907 the National Museum of Wales was incorporated by royal charter; it is situated at Cardiff, near the new city hall and new law courts. The same year a royal charter was granted founding the National Library of Wales at Aberystwith. Under the Copyright Bill of 1911, the library is to be entitled to a copy of every book published in the United Kingdom.

Language.—The Welsh language belongs to the Celtic branch of the Indo-European family. The Celtic group stands in closest relationship to the Italic, and like the latter falls into two branches according as *qu* of Indo-European is preserved or is changed into *p*. Irish and Scottish Gaelic and Manx belong to the *qu* group, while to the *p* group belong Welsh, Breton, and Cornish, as did many of the dialects of Gaul-

ish. The *qu* group is sometimes known as the Goidelic, and the *p* group as the Brythonic varieties respectively. In the period of the Roman occupation the Celtic languages were inflected. The loss of inflections has led, as in the Romance languages, to correlative changes in word order and syntax. As distinguished from the languages of the *qu* group, those of the *p* group reveal far more linguistic changes, due to levelling, new formations, change of accentuation, and similar linguistic variations of mental origin; while the languages of the *qu* group have been modified mainly by the processes of purely phonetic change. Wales has three main dialects—(1) that of Gwynedd (Anglesey and Carnarvonshire), which is probably an outcrop of the old British of N. Britain; (2) the Powysian, or that of Mid-Wales, probably a similar outcrop of the dialect of Mid-Britain; and (3) the southern, in two subvarieties—that of the S.E. or Gwentian, and that of the S.W. or Dimetian, which is an outcrop on the N. coast of the Bristol Channel of southern British, just as Cornish is the extreme of the outcrop on the southern side. Breton also appears to be a branch of the same old British dialect transferred to French soil. The literary language of Wales is common to the whole principality, and has been so from at any rate post-Roman times. Its earliest extant remains are glosses on Ovid's *Art of Love*; glosses on a small tractate on weights and measures; glosses in a MS. of Juvenecus in the Cambridge University Library, together with some Welsh verses of the same period; and glosses on Martianus Capella. These glosses belong to about the 9th century, some of them possibly earlier.

Literature.—With a few important exceptions, the chief

original works of Welsh literature are in poetry, and these are often of striking excellence. The oldest specimen of Welsh poetry is a series of stanzas from two different poems in the Juvenicus Codex of the University Library, Cambridge, belonging to the 9th century; but probably certain verses found in later MSS. of similar style belong to the same period. The *Book of Aneirin* (early 13th century) has preserved in parts the orthography of the MS. from which it was copied, and gives us specimens of poetry which may well belong to the 8th or 9th century. The main poem of this MS. is called *Y Gododin*, but it is in its present form an irregular assortment of fragments from two or more poems describing contests in N. Britain, especially the battle of Cattraeth. The main hero is Cynon ab Clydno Eiddin, a member of the family of Cynfarch, to which Urien Rheged also belonged. There are poems of the same cycle in the *Book of Taliessin* (14th century). Two chief zones existed for this poetry—namely, Gwynedd and Powys. The *Book of Aneirin* and the oldest nucleus of the *Book of Taliessin*, together with certain poems of the *Black Book of Carmarthen* (12th century), belong to the former; while other poems of the *Black Book of Carmarthen*, and most of the *Llywarch Hen* poems of the *Red Book of Hergest*, belong to the latter. In the *Book of Taliessin*, and sporadically in other books, there is a great deal of poetry which reflects the monastic studies of the early middle ages and the ideas of poetry then prevalent. From 1100–1300 Welsh poetry is represented mainly by the compositions of the court poets, Meilir, Gwalchmai, Cynddelw, Dafydd Benfras, Llywarch ab Llywelyn, Gruffydd ab yr Ynad Coch, and others. These

poems exhibit great vigour and terseness of expression, and highly developed technical skill. Towards the end of the period poetry in praise of women begins to be developed, especially by an Anglesey poet, Gruffudd ab Maredudd. This type of poetry appears to have been cultivated further by Gruffydd Gryg, an older contemporary of the greatest love poet of Wales, and one of the greatest in all literature, Dafydd ab Gwilym. The latter developed love poetry to a very high degree of perfection, but the chief characteristic of the poems is a consummate blending of the poetry of love with that of nature. In this direction Dafydd ab Gwilym found a host of imitators among later poets. The more ascetic side of Welsh life found its poetic expression in the 14th century in Sion Cent. Welsh poetry was linked with political movements by Iolo Goch, the friend of Owen Glendower, Gutto'r Glyn, Lewis Glyn Cothi, and Ieuan Deulwyn. The leading families of Wales were cordial patrons of the poets. Tudur Aled was the last pre-reformation poet of distinction. His chief successor in the Tudor period was William Lleyn. During the civil war and the period of the commonwealth the leading poet was Hugh Morris, a writer of love poetry. Towards the middle of the 18th century a great revival of Welsh poetry took place through the efforts of writers of great poetic gifts, such as Goronwy Owen, who had studied at the English universities, and who were familiar with classical models. Since that time a large number of poetic writers have given striking and characteristic expression to the various phases of Welsh life. The Welsh language is especially rich in hymns of striking beauty, written by Williams of Pantycelyn (author

of *Guide me, O Thou great Jehovah* and others. In prose the chief mediæval work is the volume of legends called *Y Mabinogion* (trans. by Lady Guest, 1838). There are extant many MSS. containing translations from French and Latin, notably stories of the Charlemagne cycle. The whole Bible was translated into Welsh from Hebrew and Greek in 1588 by Dr. Morgan, bishop of St. Asaph, and revised by Bishop Parry and Dr. John Davies in 1620. The translation of the Bible was followed by a succession of translations of devotional and theological works into Welsh. One of the most remarkable Welsh books of the 17th century is *Llyfr y Tri Aderyn* ('Book of the Three Birds'), by Morgan Lloyd, a prominent Welsh Puritan and follower of Jacob Böhme. The chief development of Welsh prose has been in the 19th century, when a large number of excellent works on theology, biography, general literature, politics, as well as works of fiction, were published.

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Books of Wales (1868), Thos. Stephens's *Literature of the Kymry* (1849), Wilkins's *Welsh Literature* (1884), R. J. Pryse's *Hanes Llenyddiaeth Gymreig* (1883), Ashton's *Llenyddiaeth Gymreig* (1893), and J. C. Morrice's *Manual of Welsh Literature* (1909).

Wales, CALVINISTIC METHODIST, OR PRESBYTERIAN CHURCH IN. The Welsh Presbyterian Church, or as it is better known the Calvinistic Methodist Church, while in reality the outcome of the preaching of Howell Harris and George Whitefield, was practically organized by the Rev. Thomas Charles (1735-1814). About half a century before his time Methodism had obtained a firm hold in Wales; but it was not at any time identified with English Methodism, being Calvinistic in its tenor. On Charles's secession from the Established Church he joined the Welsh Methodists, and about 1790-1 the organization of the body as a distinct church began. The form of government is now practically that of the Presbyterian Church. The church courts consist of a general assembly (which met first in 1864, and is the ultimate court of appeal), quarterly meetings of more restricted jurisdiction, and monthly county meetings. There are two principal colleges of the denomination—that of Bala, founded in 1837; and that of Trevecca, founded by Lady Huntington in 1769. There were, in 1910, 1,449 churches, 976 ministers and 184,588 communicants.

Wales, EDWARD ALBERT CHRISTIAN GEORGE ANDREW PATRICK, PRINCE OF, eldest son of King George V., was born at White Lodge, Sheen, on June 23, 1894. He passed the qualifying examination for the navy in April 1907, and entered Osborne College on 1st May of

that year. After completing his period of instruction there he joined Dartmouth College in May 1909. In 1911 he underwent three months' practical sea-training on board H.M.S. *Hindustan*.

Wales, PRINCE OF, the title borne by the eldest son and heir-apparent of the reigning sovereign of England since the conquest of Wales by Edward I. The title was first bestowed upon an English prince in the person of Edward (II.) in 1301, and has been regularly borne by the eldest son of the sovereign since it was granted to Edward the Black Prince. It is not, however, hereditary, but is in each case a fresh creation. The distinguishing badge of the Prince of Wales is the plume of three ostrich feathers, with the motto *Ich dien*.

Wales, UNIVERSITY OF, was founded in 1893, and comprises the university colleges of Aberystwith, Bangor, and Cardiff. Its faculties are arts, science, and medicine; and it has departments in law, music, applied sciences, and teaching. Students must reside either in the halls or in licensed lodgings. In connection with University College, Aberystwith (founded 1871), there is a men's hostel, and for women there is the Alexandra Hall. In connection with University College, Bangor (founded 1884), is University Hall, for women (opened in 1897); and with University College, Cardiff (founded 1882), Aberdare Hall, also for women. See W. C. Davies and W. Lewis Jones's *University of Wales* (1906).

Walewski, ALEXANDRE FLORIAN JOSEPH COLONNA, COMTE (1810-68), French diplomatist, born at Walewicksa in Poland, was the son of Napoleon I. and the Polish Countess Walewicksa. He founded the journal *Le Mes-*

sager, which Thiers afterwards acquired, sending (1840) its founder on a mission to Egypt, and afterwards to Uruguay and Argentina. He was next minister successively at Florence (1849), Naples (1850), Madrid (1851), and London (1851). He was minister of foreign affairs (1855-60), and presided at the Congress of Paris (1856). He wrote *Not sur la Question d'Afrique* (1837), *L'Alliance Anglaise* (1838), and a comedy, *L'Ecole du Monde* (1840).

Walfish Bay, a bay and British enclave in German S.W. Africa, in lat. 22° 56' S. The bay is the only natural harbour between Angola and the Orange R. The land possession consists of a peninsula and a stretch of sandy territory covering an area of some 430 sq. m. It has been a dependency of the Cape of Good Hope since 1884. Pop. 1,000 (850 being coloured).

Walgett, tn., New South Wales, in Baradine co., on the Namoi, near its junction with the Darling, 320 m. N.N.W. of Sydney. Pop. (dist.) 3,000.

Walhalla. See VALHALLA.

Walhalla, tn., Victoria, Australia, in Tanjil co., 90 m. E. by S. of Melbourne. The quartz reefs in the vicinity are very rich in gold. Pop. 3,000.

Walker, par. and tn., Northumberland, England, on the Tyne, 3 m. E. of Newcastle. It has iron-founding, shipbuilding, chemical manufactures, and a trade in coal. Pop. 13,500.

Walker, CLEMENT (d. 1651), was born in Dorsetshire; became M.P. for Wells in 1640, espousing the parliamentary side in the struggle against the king, and was associated with Prynne in the composition of topical pamphlets about the conduct of the war. Although he denies, in his *History of Independency* (1646-61), that he favoured the Presby-

terians, he bitterly hated the Independents; was expelled from the house in Pride's Purge (1648), and was committed by Cromwell (in consequence of the publication of the *History of Independency*) to the Tower in 1649, where he remained till his death.

Walker, FRANCIS AMASA (1840-97), American economist, born at Boston. From 1873 to 1881 he was professor of political economy at Yale, and afterwards president of the Massachusetts Institute of Technology. An advocate of the Ricardian view of rent, of international bimetalism, and of scientific education, he wrote *The Wages Question* (1876), in which he definitely exploded the theory of a 'fixed-wages fund'; *Money* (1878); *Land and its Rent* (1883); *Political Economy* (1883-4); *The Making of the Nation* (1893); *General Hancock* (1894); and *International Bimetalism* (1896).

Walker, FREDERICK (1840-75), English landscape and genre painter, born in London. He has been called the 'creator of the English renaissance'; it was he who saw the possibility of combining the grace of the antique with the realism of everyday life. His poetic vision, dignity of design, and quiet colour harmonies have influenced many younger men. He worked in an architect's office, joined the Academy schools in 1858, and designed woodcuts for illustrating Thackeray's *Philip*. His *Harbour of Refuge* and *Vagrants* are in the Tate Gallery, London. See J. G. Marks's *Life and Letters of Frederick Walker* (1896); Claude Phillips's monograph in the *Portfolio* (June 1894); J. Comyns Carr's *Frederick Walker* (1885).

Walker, GEORGE (1618-90), defender of Londonderry, was born in Tyrone. In 1669 he was appointed to the parish of Lissan in Londonderry, and in 1674 to

Donaghmore, near Dungannon. On the outbreak of the revolution he raised a regiment for the defence of Londonderry, and acted with it through the siege, which lasted from April till August 1689, the citizens being upheld by the heroic spirit of Walker. He was created bishop of Londonderry, but was killed at the battle of the Boyne. He published *A True Account of the Siege* (1689).

Walker, JOHN (?1781-1859), English inventor, was born at Stockton-on-Tees, and became a chemist (1818). He, almost by accident, invented friction matches. The honour of the discovery is, however, claimed for Isaac Holden, who arrived independently at the same solution in 1829.

Walker, THOMAS (1784-1836), English magistrate, was born in Manchester, and was called to the bar (1812). He devoted special attention to the problems of pauperism, and published *Observations on . . . Pauperism* (1831) and *Suggestions for . . . Reform in Parochial Government* (1834). In 1829 he became a police magistrate in London. In 1835 he began the publication of the weekly periodical *The Original*, on which his fame rests.

Walker, WILLIAM (1824-60), American adventurer, born in Nashville, Tennessee. He became a newspaper editor in New Orleans, and later in San Francisco. He led a filibustering expedition into N. Mexico in 1853, which was a failure; but Walker was invited to intervene in the affairs of Nicaragua, and on the death (1855) of Castillon became general-in-chief of the army, and finally president of Nicaragua. But at length Walker found himself obliged to surrender (1860) to the captain of the British man-of-war *Icarus* in order to avoid capture. The British authorities, however, handed him over

to his enemies, and he was shot. See *Oliphant's Patriots and Filibusters* (1860); J. Miller's poem, *With Walker in Nicaragua* (1873); the picturesque but mainly historical descriptions in Boyle's novel, *Fools of Fortune* (1876); Doubleday's *Reminiscences* (1886); and Roche's *Story of the Filibusters* (1891).

Walkerburn, vil., Peebles-shire, Scotland, on the Tweed, 2 m. E. of Innerleithen; has manufactures of woollen goods. Pop. 1,100.

Walkerville, a N.E. suburb of Adelaide, South Australia. Pop. 2,500.

Walking. See **ATHLETIC SPORTS**.

Walking Leaf. See **LEAF INSECTS**.

Walking-stick Insects, or **STICK INSECTS**, are, like the leaf insects, orthopterous insects belonging to the family Phasmidæ. The body is greatly elongated, and is very slender, giving the insect a resemblance to a piece of stick, while the wings are either absent, or when present are leaf-like. An example is *Lonchodes nematodes*, from the Malay Archipelago. Stick insects are vegetarian in diet. See **LEAF INSECTS**.

Walking-Sticks, a term satirically applied to candidates for the House of Commons nominated by political associations, and subject to them in their parliamentary votes (1878).

Wall, **GREAT, OF CHINA**, extends from about 98° to 120° E. longitude, and its length must considerably exceed 1,500 m. The first portions of it were built about 326 B.C. as a defence against the Hiung-nu; but it owes its design as a whole to Shih-huang-ti, of the Chin dynasty, who constructed it in ten years (214-204 B.C.). An inner wall, embracing the basin of the Sang-kau R., was built during the Ming dynasty, and a branch extends for some

distance along the border of Chili and Shan-si. Dr. Williams (*Middle Kingdom*) describes the eastern portion as composed of earth and pebbles faced with large bricks, supported on a base of stone, with a width of 25 ft. at the foot and 15 ft. at the top, and a height of from 15 to 30 ft. At intervals of about 200 yds. there are towers 40 ft. high. See W. E. Geil's *The Great Wall of China* (1909).

Wallaby. See **KANGAROO**.

Wallace, **ALFRED RUSSEL** (1823), English traveller and biologist, was born at Usk in Monmouthshire; spent four years (1848-52) collecting in the Amazon region, and then (1854-62) in the Malay Archipelago, and published *Travels on the Amazon* (1853), and *The Malay Archipelago* (1869), perhaps the most interesting of his books. While in the East, Wallace, quite independently of Darwin, thought out a theory practically identical with the theory of natural selection, and sent home his paper to Darwin while unaware of the latter's work. Wallace's views are set forth in *Contributions to the Theory of Natural Selection* (1870), and in *Darwinism* (1889), a final summing up of his views. In *Darwinism* he gives up Darwin's supplementary theory of sexual selection, and expresses the opinion that natural selection does not account for the development of the higher qualities of man. His interest in the geographical distribution of animals is shown in a monograph (1876) which marks an epoch in the development of the subject. (See also *Island Life*, 1880.) The breadth of his interests is proved by such works as *Land Nationalization* (1882), *Vaccination* (1885), *Miracles and Modern Spiritualism* (1875), *The Wonderful Century* (new ed. 1903), *Man's Place in the Universe* (new ed. 1904), *Is*

Mars Habitable? (1907), an edition, condensed, of Dr. R. Spruce's *Notes of a Botanist* (1908), and *The World of Life* (1910). See also his autobiographical work, *My Life* (new ed. 1908).

Wallace, SIR DONALD MACKENZIE (1841), English author and traveller, was private secretary to the Marquess of Dufferin and to the Marquess of Lansdowne as viceroys of India (1884-9); was political officer attached to the Czarevitch during his Indian tour (1900-1); and was director of the foreign department of the *Times* (1891-9). He was a principal editor of the tenth edition of the *Encyclopædia Britannica*, and his published works include *Russia* (new ed. 1905), *Egypt and the Egyptian Question* (1883), and *The Web of Empire* (1902).

Wallace, LEWIS [LEW] (1827-1905), American soldier and author, served in the Mexican war; and on the outbreak of the civil war joined the Federal army as a volunteer. From 1878-81 he served as governor of New Mexico, and from 1881-5 as United States minister at Constantinople. His romance, *Ben-Hur* (1880), achieved wide popularity; his other works include *The Fair God, or the Last of the 'Tzins* (1873), *The Prince of India* (1893), *The Wooing of Malkatoon* (1898), and a biography of President Harrison (1888).

Wallace, SIR RICHARD (1818-90), English collector of works of art, a natural son of Maria, née Fagnani, Marchioness of Hertford. He was brought up chiefly in Paris. He sold his own collections in 1857, but devoted himself to the formation of a more extensive collection for his half-brother, the fourth Marquis of Hertford, which in 1870 was left to him by will. This great collection his widow bequeathed to the nation in 1897, which acquired Hertford House, London, to serve

as a museum. For services during the siege of Paris to British subjects he was created a baronet, and he sat (1873-85) as M.P. for Lisburn.

Wallace, ROBERT (1831-99), Scottish theologian, journalist, and politician, born near Cupar, Fife. He became a Presbyterian minister at Edinburgh (1860-76) —Trinity College Church and Old Greyfriars'. He was accused of heresy as author of *Church Tendencies in Scotland* (1870), but obtained the chair of church history at Edinburgh (1872). Leaving the ministry (1876) he succeeded Russel as editor of the *Scotsman* till his resignation (1880). In 1886 he became M.P. for E. Edinburgh, defeating Mr. Goschen. Though a Gladstonian, he delivered a deadly criticism of the Home Rule Bill. He fell down in a fit whilst about to address the house, and never revived. His writings treat of reform of the Church of Scotland, ecclesiastical history in relation to theology, and the life of George Buchanan (1899). See *Life and Last Leaves* (1903), by Smith and Wallace.

Wallace, SIR WILLIAM (?1272-1305), Scottish hero and patriot, son of Sir Malcolm Wallace, of Elderslie in Renfrewshire. Having killed the son of the governor of Dundee Castle, in revenge for an insult, he fled to the mountains. Possessing great strength, undaunted courage, and military skill, as well as a warm attachment to his native country, he resolved to liberate Scotland from the English yoke. After capturing Aberdeen, Forfar, and other towns, he was engaged in the siege of Dundee, when news came of the advance of a large English army towards Stirling. He immediately marched to meet the enemy, gained a signal victory over them at Stirling Bridge (1297), and, entering England,

ravaged the north of the country. Wallace was at once proclaimed 'governor of Scotland in the name of King John,' John Baliol being then a captive in England. The English monarch led north, in person, an army of 80,000 men, and Wallace was defeated at Falkirk (1298). He continued a desultory warfare, until Edward obtained possession of him, through the treachery of a Scottish nobleman, Sir John Menteith. Wallace was brought to London, and was executed at Smithfield under circumstances of great barbarity (1305). His achievements have been a favourite theme with Scottish poets, and have been especially celebrated by Henry the Minstrel, sometimes called Blind Harry. See Carrick's *Life of William Wallace* (1830), Watson's *The Story of William Wallace* (1862), and Rogers's *The Book of Wallace* (1889).

Wallace, WILLIAM (1844-97), Scottish philosopher, was born at Cupar, Fife. In 1868 he became fellow and tutor at Merton College, Oxford, and in 1882 Whyte professor of moral philosophy. He published *The Logic of Hegel* (1873 and 1892); *Hegel's Philosophy of Mind*; *Lectures and Essays on Natural Theology* (1898); and *Epicureanism* (1880); *Kant* (1882); *Schopenhauer* (1890).

Wallace, WILLIAM VINCENT (1814-65), Irish musical composer, was born at Waterford. After acting as leader of an orchestra in Dublin, he went to Australia in search of health, but returned in 1845 to bring out his first opera, *Maritana*, which attained an immediate and lasting success. Among his subsequent operas were *Matilda of Hungary* (1847), *Lurline* (1860), *The Amber Witch* (1861), *The Desert Flower* (1863), and an unfinished work *Estrella*.

Wallace's Line, an apparent biological boundary line passing N.N.E. between the E. Indian

islands of Bali and Lombok and Borneo and Celebes, to the west of which the flora and fauna are distinctly Asian in character, while to the east and south the Australian elements begin to be marked, and very soon become predominant. It was named after the biologist Wallace, who defined its course in his *Island Life* (1880). The Siboga expedition (1899), however, ascertained the existence of a submarine platform only 1,020 ft. below the surface, connecting Bali and Lombok, thus disposing of the principal argument for the existence of such a line of demarcation.

Wallachia, a former principality of Europe, united in 1861 with Moldavia to form the kingdom of Roumania.

Wallaroo, seapt. tn., S. Australia, 90 m. N.W. by N. of Adelaide, near shore of Spencer's Gulf; has copper mines and large smelting works. Pop. 3,500.

Wallasey, par. and mun. bor., Cheshire, England, 3 m. N.W. of Birkenhead, of which it forms a suburb. The former marshy estuary called Wallasey Pool is now utilized for docks. The Church of St. Hilary, founded in the 10th century, was rebuilt in 1857. Pop. (1911) 78,514.

Wallawalla, city, Washington, U.S.A., co. seat of Wallawalla co., 210 m. E.N.E. of Portland, Oregon; manufactures threshing machines, flour, lumber, foundry products, leather, and malted liquors. The Wallawalla Valley is famous for its wheat and fruit. Pop. (1910) 19,364.

Wallenstein, or WALDSTEIN, ALBRECHT WENZEL EUSEBIUS VON (1583-1634), imperialist general, was born at Hermanic in Bohemia. He first distinguished himself in a campaign against Venice. When Bohemia became strongly Protestant, and elected as its king Frederick, Count Palatine, Wallenstein lost his estates.

On the overthrow of Frederick, Wallenstein was amply rewarded with confiscated lands in Bohemia, and in 1623 was created Prince of Friedland. In 1625, when Christian IV., king of Denmark, headed a northern Protestant league in opposition to the imperialist cause, the Emperor Ferdinand eagerly accepted the service which Wallenstein offered to him. Hitherto Ferdinand had employed the army of the Catholic League under Maximilian of Bavaria, whose general was the famous Tilly. The object of Maximilian was the restoration of Roman Catholicism in Germany and the diminution of the emperor's influence. The object of Wallenstein was the restoration of the imperial power and the formation of a vast centralized Hapsburg empire, which should include all Germany, and should dominate the Baltic. Wallenstein's appearance at the head of a strong force was followed by successes over Mansfeld and Bethlen Gabor, two other Protestant opponents of adventurous natures. He then attempted to secure the Baltic seaboard, and in May 1628 besieged Stralsund. Stralsund, however, defied all his efforts, and Tilly was unable to take Glückstadt. In June 1630 Gustavus Adolphus landed in N. Germany, and in July Wallenstein, at the emperor's request, resigned his command. The emperor's suicidal action was caused by the jealousy of the princes of the empire of Wallenstein in the diet which met at Ratisbon in June 1630, and was encouraged by the intrigues of Richelieu. The overwhelming successes of Gustavus forced Ferdinand again to have recourse to Wallenstein, who in 1632, accepting command on his own terms, raised a fresh army. After defeating Tilly on the Lech, Gustavus found him-

self confronted by Wallenstein. The battle of Lützen, on November 1632, was lost by Wallenstein, though the death of Gustavus was a compensating fact. After invading Silesia, Wallenstein once more incurred the jealousy of Maximilian of Bavaria and the Catholic princes. He then tried to win over his officers to resist all attempts to effect his disgrace. In this he failed, and on Feb. 24, 1634, he was assassinated by some Irish and Scottish officers. He was one of the great figures of the Thirty Years' war, and was a man of transcendent ability, but unscrupulous character. See Ranke's *Wallenstein* (ed. 1880); Förster's *Wallenstein as Reigning Sovereign and Landed Proprietor* (1834).

Waller, EDMUND (1606-87), English poet, born at Coleshill, Bucks; was in 1622 admitted a member of Lincoln's Inn. He was elected M.P. in the following year. In 1643 he was one of the commissioners appointed to treat with the king at Oxford. Shortly afterwards 'Waller's plot,' the aim of which was to hold London for the king, was discovered. His life was spared, but he was fined £10,000 and exiled (November 1644). He retired to France, and published his first volume of poems (1645). The sentence of banishment was revoked in 1651, and in 1655 he was made a commissioner of trade. In 1654 he acknowledged Cromwell's favour by *A Panegyric to My Lord Protector*, and later wrote a poem, *Upon the Death of the Lord Protector*; but at the restoration he produced a poem, *To the King on his Majesty's Happy Return*. In 1661 he became M.P. for Hastings, and continued to sit in Parliament till his death. In 1685 he published his *Divine Love*, his longest poem. Waller was one of the founders of the classical school of poetry, and helped to

mould the heroic couplet in the form which Dryden and Pope were to perfect. His reputation rests chiefly on his lyrics, such as *Go, Lovely Rose*, and *On a Girdle*. His *Works* were edited by Fenton (1729), and by Thorn Drury (1893); and his *Poems* by Thorn Drury (1903). See *Life* by Stockdale (1772) and by Dr. Johnson.

Waller, LEWIS (1860), English actor, born at Bilbao in Spain; made his first appearance on the stage at Toole's Theatre, London, in *Uncle Dick's Darling* (1883). In 1895 he leased the Haymarket Theatre, London, when he produced Oscar Wilde's *An Ideal Husband*. His chief appearances, however, on the boards have been in Shakespearean characters, among them Brutus in *Julius Cæsar*, the Bastard in *King John*, and the title rôle in *Henry V.*, perhaps his most successful impersonation.

Wallflower. See CHEIRANTHUS.

Wallin, JOHAN OLOF (1779-1839), Swedish poet and divine, born in Dalecarlia; in 1805 won the Academy's prize for the didactic poem *Uppfostraren*; elected (1810) a member of the Academy; and soon after appointed one of the committee for revising the church hymn book, to which he contributed some beautiful hymns. He was also the most eloquent preacher the Swedish Church has ever possessed. In 1837 he was nominated archbishop of Upsala. His works appeared as *Samlade Vitterhetsarbeten* (1878).

Wallingford. (1.) Munic. bor. and mrkt. tn., Berkshire, England, on the Thames, here crossed by a fine old bridge (partly rebuilt in 1809), 15 m. N.W. of Reading. It was strongly fortified by the Romans. In 1006 it was burnt by the Danes, but was soon rebuilt. Its castle was demolished in 1653. In Leland's time there were four-

teen parish churches, of which only three now remain. Pop. (1911) 2,716. (2.) Town, New Haven co., Connecticut, U.S.A., 12 m. by rail N.N.E. of New Haven; is the seat of the Wallingford community. The manufactures include rubber goods, fireworks, silver, nickel, britannia, brass, and plated ware. Pop. (1910) 11,153.

Wallington, par. and vil., Surrey, England, 3 m. S.W. of Croydon. Pop. 5,200.

Wallis, JOHN (1616-1703), English mathematician, was born at Ashford, Kent, and in 1648 was appointed Savilian professor of geometry at Oxford. He was one of the founders of the Royal Society, and acted as one of the secretaries of the Westminster Assembly. His chief work is *Arithmetica Infinitorum* (1655). His *Works* were published in 1791.

Wallon, ALEXANDRE HENRI (1812-1904), French historian and statesman, was born at Valenciennes. He succeeded Guizot at the Sorbonne in 1850 as lecturer on history and geography. In 1860 he obtained the Gobert prize of the French Academy for an essay on Joan of Arc. He was a member of the National Assembly in 1849, minister of education 1875-6, and represented the department of the Nord after the fall of the empire. In 1850 he was elected member of the Academy of Inscriptions, and in 1873 became its perpetual secretary. He wrote *Richard II.* (1864), *La Terreur* (1873), *Saint Louis et son Temps* (1875; 3rd ed. 1887), *Histoire du Tribunal Révolutionnaire de Paris* (6 vols. 1880-2), and *Les Représentants du Peuple en Mission*, etc. (5 vols. 1888-90).

Walloons, the inhabitants of south-east Belgium, are Celts, direct descendants of the Gaulish Belgæ. A line drawn from near St. Omer, through Central Belgium, to Maestricht roughly separates the Flemish lowlanders

from the Walloons of the uplands, who in 1900 numbered 2,575,000 of exclusive Walloon speech, besides 800,000 bilingual (Walloon and Flemish). The Walloons—i.e. “Welsh” or “Foreigners”—are physically distinguished from the Flemings by their darker colour, taller stature, stronger and more angular frames. The Walloon language is a North French dialect, independently developed, but showing marked affinities to the *patois* of Picardy and Lorraine. See Chavée's *Français et Wallon* (1837), E. Reclus's *Universal Geography* (Eng. trans. vol. iii.).

Wall-paper, the modern substitute for tapestry, stamped leather, and other mural hangings, was introduced into Europe from China and Japan by the Dutch and Spanish about 1555, and a few imitations of Genoese velvet were made of ‘flock,’ on small hand-made pieces, in England in the 16th century. In 1744 Jackson of Battersea, London, produced some panelled pictures, printed in oil from wooden blocks, interspaced with plain paper. Réveillon established a factory in Paris in 1760. Wall-paper came into general use about 1830, and the abolition of the paper duty in October 1861 raised at once the output. ‘Patterns of inconceivable hideousness’ (*Arts and Crafts Essays*, by Walter Crane, 1893) were replaced by the Venetian, Indian, and Early English designs of William Morris, followed by Walter Crane and Heywood Sumner. Designing is now largely done by ladies.

Wall-paper is printed either from blocks or by machine. The former process is dearer but more efficient, machine-made paper being harder in effect, and the printing not so clearly defined. The wooden block is coloured from the ‘sieve,’ and then pressed on the paper, each colour being sep-

arately printed and dried, unless ‘patching’ or ‘blending’ is resorted to, when several colours may be printed at once. The design, if fine, is outlined on the block in a kind of *cloisonné* of copper wire. A ‘tireboy’ (*tirer*) sees to the colours and dries the paper. To make ‘flock’ paper a mordant is printed on the coloured ground, to which the ground wool adheres as the paper passes through a drum or trough of linen. ‘Silk flock’ is used for a final coating, being of longer pile and glossier. Chameleon effects are produced by laying a transparent surface of flocking on ready printed designs, the glinting of shot silk being almost realized. Gold size, bronze, leaf metal, and laquer are all used as ornaments. Paper embossed in high relief is first embossed and then adorned by hand; in low relief, first printed, and then embossed by pressure between intaglio and relief plates. In machine work designs are printed on paper coloured in pulp, or on distemper colours laid on and spread by fast-revolving brushes. All the colours are printed simultaneously, and the paper, passed over a long wooden framework, is then dried and folded. See *Art Journal* (1901), article by Horace Warner; and *Magazine of Art* (1900), article by Aymer Vallance.

Wall Plate, a plate laid along the top of the wall of a building to take the ends of the roof trusses, and distribute the weight of the roof along the top of the wall. See CARPENTRY—*Roofs*.

Wallsend. (1.) Munic. bor., Northumberland, England, on the l. bk. of Tyne, 4 m. E.N.E. of Newcastle; marks the termination of the Roman wall. It is a shipbuilding centre, and has lead and copper smelting and engineering works. Coal is produced. Pop. (1911) 41,464. (2.) Town, Northumberland co., New South

Wales, 65 m. N. by E. of Sydney, in a rich coal-mining district. Pop. 4,000.

Wall Trees and Fruit. Many climbing plants do best when growing against a wall; in the warmer parts of England, against walls facing south or west such fruits as nectarines, peaches, apricots, and figs may be grown. The walls should be not less than eight feet in height, and should be furnished with a stone coping projecting some three inches on either side, or preferably with glass copings projecting nine inches or more and supported by iron props. For fastening the branches to the walls some system of wiring is preferable, the branches being attached to the wires by cord or loosely applied lead wire.

Walmer. (1.) Par. and wat.-pl., and member of the Cinque Port of Sandwich, on the E. coast of Kent, England, 2 m. S. by W. of Deal. It consists of two parts, Upper and Lower, the latter of which is most frequented by visitors. Pop. (1911), urb. dist., 5,347. Walmer Castle was built by Henry VIII. Until 1905 it was the official residence of the Warden of the Cinque Ports; it is now opened to the public as a Wellington museum, but Lord Brassey, the present (1912) Lord Warden, proposes to reoccupy it as an official residence. The Duke of Wellington died here (1852). (2.) A suburb of Port Elizabeth, Cape of Good Hope; has a sanatorium. Pop. 2,000.

Walmer Whirlwind. See WHIRLWIND.

Walnut (*Juglans regia*), a tree grown in Britain for its fine foliage and handsome habit, as well as for its timber and its fruit. It will thrive in any soil of moderate quality and good depth, and is not very subject to disease. The black walnut (*Juglans nigra*)

grows extensively in the United States, where it often reaches sixty feet in height.

Walpole, HORACE, FOURTH EARL OF ORFORD (1717-97), English author, was born in London, the youngest child of Sir Robert Walpole. In 1739 he started on the grand tour of France and Italy, in company with Gray the poet. At Florence he made the friendship of Horace Mann, with whom he maintained an unbroken correspondence for forty years. After his return to England, Walpole represented in Parliament Callington (1741-54), Castle Rising (1754-7), and King's Lynn (1757-68). His memoirs and correspondence are important sources of information for the inner political history of his time. An ample fortune—mainly derived from the lucrative sinecure offices of usher of the Exchequer, clerk of the Escheats, and controller of the Pipe—enabled him to indulge fully his social and antiquarian tastes. In 1747 he purchased the villa of Strawberry Hill, near Twickenham on the Thames, and its adornment became thenceforth the hobby of his life. Here, in 1757, he established his printing-press, the first book to be issued being Gray's *Odes*, with illustrations by Bentley. In 1764 he published *The Castle of Otranto*, which helped to inaugurate a school of romance, just as his 'paper fabric' on the Thames stimulated the revival of Gothic art. His antiquarian works, notably the *Catalogue of the Royal and Noble Authors of England* (1758), *Historic Doubts of the Life and Reign of King Richard the Third* (1768), *Anecdotes of Painting in England* (1762-71; republished by Wornum, 3 vols. 1839), and *Catalogue of Engravers Born and Resident in England* (1763), show acuteness and diligence of research. In ease, playful wit, racy

description and anecdote, variety of topic, and lightness of touch, no letter writer—unless it be Madame de Sévigné—has surpassed him. It is in the deeper qualities of mind and heart that he is found wanting. In character he was affected, capricious, and sometimes spiteful, but not incapable of generosity and warm friendship. His collections were dispersed under the hammer in 1842. The standard editions of the *Letters* are that of Peter Cunningham (9 vols. 1857-9), and that of Toynbee (16 vols. 1903-6). Some are included in Miss Berry's *Journal and Correspondence* (1865). He also wrote *Memoirs of the Last Ten Years of the Reign of George II.* (ed. by Lord Holland, 1822); *Memoirs of the Reign of King George III.* (ed. by Marchant, 1845); the supplementary *Journal of the Reign of George III., from 1771-83* (ed. by Dr. Doran, 1859); and the *Reminiscences* (1805), written for the Misses Berry. See *Horace Walpole*, by Austin Dobson (new ed. 1910); *Horace Walpole and His World*, by L. B. Seeley (1884); and Lord Macaulay's *Essay on Walpole's Letters to Sir Horace Mann* (1833).

Walpole, ROBERT (1676-1745), English statesman, was born at Houghton in Norfolk. Returned to Parliament for Castle Rising in 1701, and in 1702 for Lynn, both places being pocket boroughs of the Walpole family, he joined the Whigs, and in 1708 was made secretary for war. In 1710 he became treasurer of the navy. The Tory party brought a charge of corruption against Walpole in connection with his position as secretary for war. He was sent to the Tower, expelled from the house, and declared to be disqualified for re-election during the Parliament. The borough of Lynn at once re-elected him, but he was again expelled. A firm upholder of the

Hanoverian dynasty, Walpole, on the accession of George I., held office in the Whig ministry which the king appointed. After occupying for a year the post of paymaster of the forces, he was appointed in 1715 first commissioner of the Treasury and chancellor of the Exchequer. In 1717 he resigned in consequence of the king having dismissed his friend Townshend, and having transferred his favour to Sunderland and Stanhope. In opposition, Walpole distinguished himself by his attack on the Peerage Bill of Sunderland, whose object was to make the House of Lords a close corporation. His speech, which was the means of defeating the measure, has been described as one of the most masterly ever delivered in the House of Commons. In the financial panic occasioned by the South Sea disaster the nation looked to Walpole for deliverance, and all the more readily as he had from the first denounced the scheme. He was made lord of the Treasury and chancellor of the Exchequer, became virtually supreme in the government, and remained so for twenty-one years. During his long career Walpole was inspired by three desires—to bring the court and the House of Commons into working alliance, by identifying the Hanoverian dynasty with parliamentary institutions; to unite the nation under the new dynasty, by keeping as free as possible from foreign alliances; and to make the nation prosperous, by fostering individual energy and commercial enterprise. In 1721 appeared in the king's speech the first definite enunciation of the principles of free trade in the fiscal government of the nation. All Walpole's fiscal measures were framed on these lines; he saw through the dangerous doctrine that colonies exist exclusively for the

fiscal convenience of the mother country. His fall was due to his inability to restrain the popular feeling over the war with Spain, the war-cry of which was the famous 'Jenkins's ear.' He resigned on Feb. 2, 1742, and was created Earl of Orford, Feb. 9. A committee of the House of Commons reported against him in connection with a charge of bribery; but the proceedings collapsed. Walpole was a man of coarse moral fibre, gross pleasures, and no intellectual tastes. Yet he left an enduring impress for good and evil upon the history of England. His great claim to recognition rests on the fact that he gradually reconciled the reluctant nation to the new dynasty. Under his guidance also parliamentary institutions in the forms familiar to us emerged from the chaos of the revolution period and took firm root; and his careful avoidance of all foreign entanglements allowed the material prosperity of the country to develop. On the other side of the account Walpole must bear the responsibility for giving a low tone to politics. He is the real creator of the party system in its worst form. He did not hesitate to stoop to corruption in order to secure party successes. Walpole's influence was reflected in the general manners of the time, which was in this regard one of the most repulsive in the national annals. See *Lives* by Coxe (3 vols. 1798), Ewald (1877), and Lord Morley in 'Twelve English Statesmen' Series.

Walpole, SIR SPENCER (1839-1907), English administrator and author, entered the War Office (1858); was made an inspector of fisheries (1867), and appointed lieutenant-governor of the Isle of Man (1882), which post he held till he became secretary to the Post Office (1893-9). Among his

works are *Life of Spencer Perceval* (1874), *The Electorate and the Legislature* (2nd ed. 1892), *Foreign Relations* (1882), *History of England from 1815* (new ed. 1890), *Life of Lord John Russell* (2nd ed. 1891), *The Land of Home Rule* (1893), and *The History of Twenty-five Years* (1904).

Walpurga, or **WALBURGA** (d. 778), abbess of Heidenheim in N. Bavaria, a British saint who formed one of the mission to Germany under St. Boniface. Her day being May 1, she has been associated with 'Walpurgis Night,' when the witches hold revel on the Harz Mts. Her life is to be found in the *Lives of the Women Saints of our Contrie of England*, edited by C. Horstmann (1886); also in Capgrave's *Nova Legenda Angliæ* (1516).

Walrus, or **MORSE** (*Trichechus rosmarus*), a large pinniped carnivore, nearly related to the eared seals, but constituting a special family, the Trichechidae. It is confined to the Arctic regions, and occurs in two varieties, a Pacific and an Atlantic form. On the coast of Alaska it was formerly very abundant, and also in the Atlantic at one time, as far south as the coasts of Nova Scotia, Newfoundland, and Labrador on the west and the north of Scotland on the east. The walrus is a clumsy animal, reaching a length of twelve feet and a weight of 3,000 lbs. As in the eared seals, the hind limbs are capable of being turned forwards to support the weight of the body, and the first and fifth toes are larger than the three median ones. The toes of the hind feet have, further, large lobes projecting beyond the ends of the bones. External ears are totally absent, however—a point of distinction from the eared seals—and the canines of the upper jaw are greatly enlarged to form the conspicuous

projecting tusks. The muzzle is divided into two parts by a groove between the nostrils, and the upper lip is furnished at each side with a number of conspicuous bristles. The tail is small, the fore limbs nearly as large as the hind, and there are five small claws on both fore and hind feet. As regards the teeth, the walrus is peculiar. In the upper jaw, apart from the huge tusks, there are in the adult only four small teeth at each side. One of these is an incisor; the other three are premolars. In the lower jaw there is no incisor; a small tooth represents the tusk of the upper jaw, and behind it there are three premolars, as in the upper jaw. In the young, however, the teeth number thirty. Fish, crustaceans, and seaweed are eaten, though the last possibly only for the sake of its animal contents. The young walrus is covered with short brownish fur, but this becomes rubbed off with advancing years. Walruses are usually found in the vicinity either of land or of floating ice. They are markedly social, and, except at the breeding season or when attacked, are gentle and inoffensive. It would appear that the females breed only once in three years, and they are singularly devoted to their young, which they suckle for two years. Walruses are hunted for the sake of their oil, and for their hides and the ivory of the tusks.

Walsall, munic., par., and co. bor., Staffordshire, England, 8 m. N.W. of Birmingham. Iron and brass founding, tanning, currying, saddlery and harness furnishings, are important industries, and there are extensive collieries and limestone quarries in the vicinity. Pop. (1911) 92,130.

Walsh, WILLIAM (1663-1708), a man of fashion devoted to letters, was born at Abberley, Worcestershire; was M.P. for Worcestershire (1698-1702), and

for Richmond (1705). He steadily advocated the Protestant succession. Walsh was the author of elegies and love poems. In *Delia*, one of five pastorals, he eulogizes Mrs. Tempest, the subject of Pope's fourth pastoral. Walsh was a dramatic collaborator with Congreve and Vanbrugh, and in prose he wrote *Dialogue concerning Women, being a Defence of the Sex* (1691), and the posthumous *Æsculapius, or the Hospital of Fools* (1714). *Pope's Correspondence with Walsh* (1735) is of great interest. The *Works of William Walsh* appeared in 1736. See *Lives* by Johnson and Cibber (1753).

Walsham, NORTH, urb. dist. and mrkt. tn., Norfolk, England, 14 m. N.N.E. of Norwich; has market cross (1600). Pop. (1911) 4,254.

Walsingham, tn., Norfolk, England, 6 m. N.E. of Fakenham. An Augustine priory (founded 1061, and refounded 12th century) had a shrine much resorted to in mediæval times. Pop. 900.

Walsingham, SIR FRANCIS (c. 1536-90), English statesman, born at Chiselhurst. His first diplomatic appointment was as ambassador to France in 1570. On his return (1573) Elizabeth made him a secretary of state. He was then employed in important negotiations with the Netherlands, France, and Scotland. In Mary Queen of Scots he saw a dangerous enemy to the English throne, and managed to intercept her letters, copying them and sending them on to their destination, and treating the replies in the same fashion. He was one of the commission appointed to try Queen Mary at Fotheringhay. Walsingham belonged to the Puritan party.

Walsingham, THOMAS (d. ?1422), English historian, was born probably in Norfolk, and became a monk at St. Albans.

He is the best authority for the reigns of Richard II., Henry IV., and Henry V., including the insurrection of Wat Tyler and the Lollardist movement started by Wycliffe. Walsingham wrote six chronicles, of which we possess five—*Chronicon Angliæ* (1328-88); *Gesta Abbatum* (1390); a nameless chronicle (1272-1394, the St. Albans MS.); *Historia Anglicana* (1272-1422); *Ypodigma Neustriæ* (Normandy, 1066-1418), all published in the Rolls Series.

Walsoken, urb. dist., on the border of Norfolk, England, 1 m. N.E. of Wisbech, of which it forms a suburb. Pop. (1911) 3,898.

Walsum, tn., Rhenish Prussia, on the Rhine, 22 m. N. of Düsseldorf. Pop. (1910) 7,570.

Walter, Lucy (?1630-58), mistress of Charles II. and mother of the Duke of Monmouth, was born in Pembrokeshire, and was taken or sent to the Hague, where in 1648 she captivated Charles II. She returned to England in 1656, but after being imprisoned in the Tower, was deported by order of Cromwell. She died in Paris. Between 1673 and 1680 the rumour was circulated, in the interests of Monmouth's succession, that she had been legally married to Charles II., but the king made three solemn declarations of denial.

Walter Family. THE. See TIMES, THE.

Waltershausen, tn., Saxe-Coburg Gotha, Germany, 8 m. W.S.W. of Gotha. It has various industries and a mediæval castle, now used for administrative purposes. Pop. (1910) 7,534.

Waltham, city, Middlesex co., Massachusetts, U.S.A., on the Charles R., 10 m. W. of Boston. It manufactures watches (here is the largest watch factory in the world), textiles, automobiles, bicycles, and lumber products. The first complete cotton mills in the United States were estab-

lished here about 1814. Pop. (1910) 27,834.

Waltham Holy Cross, urb. dist., Essex, England, on Lea, 13 m. N. of London; has remains of an abbey built by Henry II., the restored nave being now the parish church. In an earlier church King Harold is said to have been buried. There are gunpowder and cordite works and breweries, and market-gardening is carried on. Pop. (1911) 6,796.

Walthamstow, urb. dist. and metropolitan industrial suburb, near Epping Forest, 7 m. N.E. of London, England. Pop. (1911) 124,597.

Walther von der Vogelweide (c. 1160-c. 1230), the most renowned of the minnesingers of Germany, began his career as a poet at the court of the archduke of Austria, but after 1198 led the life of a wandering minstrel until taken into favour by the Emperor Frederick II. He was the first of the minnesingers to use his verse as a political weapon, but the genre in which he excelled was the lyric. His poems were edited by Lachmann (5th ed. 1875) and by Pfeiffer (6th ed. 1880). See *Lives* by Uhland (1822) and Wilmanns (1882).

Waltner, CHARLES ALBERT (1846), French etcher, was born at Paris; became a pupil of Gerôme, and obtained the Prix de Rome (1868); but soon abandoned painting for etching, in which he achieved a world-wide reputation. Besides copper-plates after Rembrandt, Van Dyck, Rubens, and Velasquez, he has etched *Dans la Rosée*, after Duran; *Christ before Pilate*, after Munkacsy; *Mrs. Graham*, after Gainsborough; and *L'Angelus*, after Millet.

Walton, BRIAN (1600-61), English Biblical scholar, was born in Yorkshire. In 1626 he was appointed rector of St. Martin's Orgar in London. In 1641 he

was deprived of his living, and thenceforth devoted himself to the preparation of his Polyglot Bible (1654-7). He had the assistance and sympathy of Usher, Lightfoot, and other scholars, and the patronage of Cromwell. Nine languages are used, although no portion of Scripture is presented in all the nine—Hebrew, Chaldee, Samaritan, Syriac, Arabic, Persian, Ethiopic, Greek, and Latin. He became bishop of Chester in 1660.

Walton, IZAAK (1593-1683), English biographer and angler, was born at Stafford, and became an ironmonger in Fleet Street, London, near St. Dunstan's. He had many literary acquaintances, amongst whom were Ben Jonson, Michael Drayton, and Sir Henry Wotton, and was himself given to versifying as well as to the sport of angling. He helped Sir Henry Wotton to collect material for the life of Donne, and when Wotton left it unfinished in 1639, wrote it himself. This was the first of his famous biographies. About 1644 Walton settled at Stafford. By 1650 he was back in London, living at Clerkenwell. In 1653 he published *The Compleat Angler*. After the restoration he lived with George Morley, bishop of Winchester, and subsequently with W. Hawkins, prebend of Winchester. He also visited on the Dove Charles Cotton, who wrote the second part of the *Angler*. Walton's works include *Life of Donne* (1640; ed. H. K. S. Causton, 1852); *Life of Wotton* (with *Reliquiae Wottonianae*, 1654); *Life of Hooker* (1665); *Life of George Herbert* (1670); *Life of Sanderson* (1678); *Collected Lives* (1670; ed. A. H. Bullen, 1884; ed. V. Blackburn, 1895; ed. A. Dobson, 1898; ed. A. W. Pollard, 1901); *Compleat Angler* (1653; ed. J. R. Lowell, 1889; ed. A. Lang, 1896; ed. R. Le Gallienne,

1896-7; ed. A. Dobson, 1899; ed. Clarendon Press, 1900; ed. J. Buchan, 1901); *Waltoniana* (ed. R. H. Shepherd, 1878). See *The Tercentenary of Izaak Walton* (1893); R. B. Marston's *Walton ... on Fish and Fishing* (1894); Martin's *Izaak Walton and his Friends* (1903); and *Bibliography* by A. Wood (1900).

Walton le Dale, urb. dist., Lancashire, England, on the Ribble, 2 m. S.E. of Preston. There are cotton mills and iron foundries. Pop. (1911) 12,352.

Walton-on-Thames, urb. dist., Surrey, England, 17 m. S.W. of London; a resort of anglers and tourists. Here is the Metropolitan Convalescent Institution, founded 1840. Pop. (1911) 12,858.

Walton-on-the-Hill, tn., S.W. Lancashire, England, now forming a suburban district of Liverpool.

Walton-on-the-Naze, or **WALTON-LE-SOKEN**, wat.-pl. and par., Essex, England, 7 m. S. of Harwich. There are iron foundries and brickworks. During the season a regular service of passenger steamers from London calls here. The church is modern, the ancient building and nearly all the old village having been swallowed up by the sea. Pop. (1911) 2,173.

Waltrop, tn., Westphalia, Prussia, 25 m. E.N.E. of Essen. Pop. (1910) 8,001.

Waltz, a dance in $\frac{3}{4}$ time, performed by dancers in couples, with sliding steps and a revolving motion. Besides the popular music constantly produced for this dance, there is music of a more classical kind, of which the waltzes of Strauss are the most noteworthy. Yet another type of waltz is represented by those of Chopin and Liszt, in which the form is utilized for compositions often of distinguished merit and charm, though not intended for use as dance music.

Wam. See SHARI.

Wampum, a sort of broad belt formed of strings of shells, and worn as an ornament or girdle by the North American Indians. The name has also been given to the interior parts of the clam shell, formerly used as money among them.

Wanderer, THE, a poem in the *Exeter Book*. There is an almost complete absence of Christian sentiment; but from the standpoint of poetic art it is the finest poem in Old English—a long lament for the joy and glory of past days. The text is in Sweet's *A.S. Reader*. See Wülker's *Grundriss*, the *American Journal of Germanic Philology* (1902), and K. M. Warren's *Treasury of English Literature*, vol. i. (1908).

Wandering Jew, THE. See JEW, THE WANDERING.

Wanderoo, or WANDERU, a name applied in Ceylon to the various species of langur which inhabit that island, notably to *Semnopithecus cephalopterus*, and also, though incorrectly, to one of the macaques, the lion-tailed monkey (*Macacus silenus*), found in W. India.

Wandiwash, tn., N. Arcot dist., Madras Presidency, India, 30 m. s.w. of Chengalpat. It was the scene of the victory by Sir Eyre Coote over the French in 1760. Pop. 6,000.

Wandre, vil., Belgium, in prov. of and 5 m. N.E. of Liège. Pop. 5,600.

Wandsbek, or WANDSBECK, tn., Schleswig-Holstein, Prussia, 3 m. N.E. of Hamburg, of which it is practically a suburb; has manufactures of oleographs, beer, leather, and tobacco. There is a monument to Claudius, who issued *Der Wandsbecker Bote* weekly (1771-75). Pop. (1910) 35,212.

Wandsworth, met. and parl. bor. and par., England, in co. of London. Wandsworth is the

largest of the met. bors. in area (9,108 acres), and includes the districts of Putney by the Thames, part of Clapham in the N.E., Streatham in the S.E., Balham and Upper and Lower Tooting in the centre and south. The industries include oil mills, dye works, paper works, calico printing, brewing, etc. Pop. (1911)—met. bor. 311,402; parl. bor. 253,797.

Wanfercée-Baulet, vil. in Hainaut prov., Belgium, 7 m. N.N.E. of Charleroi. Pop. 6,200.

Wanganui. (1.) Town, New Zealand, on Wanganui R., 4 m. from the sea, 95 m. N. of Wellington. It has freezing works and a collegiate school. Pop. 8,200. (2.) River, New Zealand, 120 m. long; rises at the base of Mt. Tongariro, and flows into the S. Taranaki Bight, on the W. coast of the North Island of New Zealand.

Wangaratta, tn., Victoria, 130 m. N.N.E. of Melbourne, at the junction of the Ovens and King rivs., and of Bogong, Delatite, and Moira cos. The district produces large quantities of grain, grapes, oranges, lemons, tobacco, and hops. Pop. 3,500.

Wanks. See COCO.

Wanlockhead, vil., Dumfriesshire, Scotland, 6 m. W.N.W. of Sanquhar. Lead mines have been worked here since 1680. Pop. (1911) 618.

Wanne, comm., Prussia, in Westphalia, 4 m. N.W. of Bochum; has coal mines. Pop. (1910) 38,751.

Wanstead, urban dist., Essex, England, forming a residential dist. of London, 8 m. N.E. of St. Paul's. Pop. (1911) 13,831.

Wantage, mrkt. tn., Berkshire, England, 1 m. from the Berks and Wilts Canal. It was a royal residence in the time of the West Saxons, and is famous as the birthplace of Alfred the Great in 849. Schools have been

established in commemoration of Alfred, and a fine marble statue of that king was erected in 1877. There are brass and iron works. Bishop Butler, author of the *Analogy*, was born here in 1692. Pop. (1911) 3,628.

Wapakoneta, tn., Ohio, U.S.A., co. seat of Anglaize co., 12 m. s. by w. of Lima. The Shawnees and Senecas signed here in 1831 a treaty ceding their lands to the U.S.A. There are manufactures of machinery and furniture. Pop. (1910) 5,349.

Wapenshaw, an obsolete Scotch military meeting or review, especially stringent and compulsory under the Stuarts, when the lieges were compelled to collect themselves, at certain times and within certain specified areas, to 'show their weapons' of military defence, and prove that they were fit—according to their rank—to take the field at a moment's notice. Various kinds of sports, such as shooting at the butts, were in vogue at these gatherings.

Wapentake. In Yorkshire, Lincolnshire, Nottinghamshire, Derbyshire, Rutland, and Leicestershire the divisions of 'hundreds' are known as **wapentakes**.

Wapiti (*Cervus canadensis*), a North American deer, belonging to the same group as the Scottish red deer, often misnamed elk in America. The antlers are greatly developed, are smooth, and have the surroyal tines, usually three or more in number in the adult, flattened and expanded, while the beam is markedly curved backwards. The colour is dark brown on the head and neck, gray on the back, flanks, and sides, and blackish below, the legs being brown. The height at the shoulder is about five and a half feet in a full-grown stag, which may weigh as much as a thousand pounds. In habits the **wapiti** resembles the red deer.

Wappers, EGIDE CHARLES GUSTAVE (1803–74), Belgian painter, was born at Antwerp, where he became professor of the Academy (1832); was director (1840–53) of the same, and president (1846–53) of the Belgian National Museum. His first great work was *Dévouement du Bourgmestre de Leyde* (1830). From Antwerp he was called by the court to Brussels, where he executed a large number of works for the Paris salon, including *Le Christ au Tombeau*, *Scènes des Journées de Septembre*, *L'Adieu de Charles I. à ses Enfants*, *La Tentation de Saint Antoine*, *Geneviève de Brabant*, and *Christophe Colomb*. For the gallery of Versailles he was commissioned by Louis Philippe to paint *La Défense de l'Île de Rhodes par les Chevaliers de Saint-Jean de Jérusalem* (1844).

Wapping, dist. of London, England, on the N. bank of the Thames. Here are situated the London Docks.

War. While civilization is impotent to prevent the outbreak of war, it has done much towards mitigating its horrors by bringing about a consensus among all cultivated peoples that, while it is legitimate to put forth the utmost force in order to render the enemy powerless, no act of violence or destruction useless to that object, and merely wanton or reckless, shall be permissible; hence 'customs of war' which make it foul play to molest peaceful inhabitants who safeguard their property, which forbid ill-treatment of prisoners, which prescribe immunity for flags-of-truce and for hospitals, and so forth.

A war, politically speaking, may be offensive or defensive; but the operations on both sides must be of both natures. War may be waged on the sea as well as on the land. A powerful

fleet is indispensable to a maritime nation; while an insular power cannot even convey its armies abroad except under the safeguard of its warships. Further, in the defence of its shores its fleets will probably play the more important part. But it is not always easy to bring a war to a decisive issue by the action of a navy alone. The considerations which determine the actual operations of war, and the methods by which these are carried out, belong to the provinces of strategy and tactics.

Waratah. (1.) Town, New South Wales, Northumberland co., 4 m. N.W. of Newcastle. The principal industries are fruit-growing, coal-mining, copper-smelting, and brick-making. Crystal Palace Gardens are a holiday resort. Pop. 3,100. (2.) Or MOUNT BISCHOFF, tn., Tasmania, 82 m. W. of Launceston. In the vicinity are tin mines, the Mount Bischoff mine being reputed to be the richest tin mine in the world. Gold, silver, and bismuth also occur. Pop. (dist.) 5,000.

Warbeck, PERKIN (1474-99), pretender to the English crown, claimed to be the younger of the two Yorkist princes murdered in the Tower by Richard III., and his claims were supported by the Duchess of Burgundy, the sister of Edward IV. and aunt of the victims. In 1491 he landed in the south of Ireland, and having obtained recognition there, he proceeded to the French court, which assisted him in an ineffectual attempt to make a landing in Kent (1495). After several other unsuccessful attempts he went to Cornwall (1497), but when he met with armed opposition he fled into sanctuary. He was imprisoned, escaped, and was finally confined in the Tower, where, in company with the Earl of Warwick, he was executed (1499).

Warble-fly. See BOT-FLY.

Warblers are usually regarded as constituting a subfamily (Sylviinae) of the thrush family. They differ from the typical thrushes in their smaller size, in the fact that their plumage is usually plainly coloured, and in being more markedly insectivorous. They are more distinctly migratory in their habits than thrushes. A large number of warblers are British—as the blackcap, white-throat, chiffchaff. The garden-warbler (*Sylvia hortensis*) is a member of the same genus as the blackcap and the whitethroat. It is olive brown above and paler below, and is about the same size as the blackcap. Other warblers of the same genus are the barred warbler (*S. nisoria*), the Dartford warbler (*S. undata*), and the Orphean warbler (*S. orphea*). To the genus *Phylloscopus* belong the chiffchaff (*P. collybita*), the willow-wren (*P. trochilus*), and the wood-warbler (*P. sibilatrix*). The reed-warbler (*Acrocephalus streperus*), which is frequent in summer in certain localities in England, is an example of a genus with a considerable number of British representatives. Commoner is its ally, the sedge-warbler or sedge-bird (*A. phragmitis*), which occurs throughout Great Britain generally. To the genus *Locustella* belongs the grasshopper-warbler (*L. naevia*). To the warbler family belong also the members of the genus *Regulus*, of which *R. cristatus* is the gold-crested wren; *R. ignicapillus*, the fire-crested wren; and *R. calendula*, the ruby-crested wren of the United States. Most of the warblers are Old World birds, and in N. America the name is applied to the member of a different family, the Mniotiltidae, probably most nearly allied to the tanagers. These American warblers are rather small birds, and somewhat resemble tits in

their habits. There are a large number of species, many of which belong to the genus *Dendroeca* or wood-warblers, of which the black-throated green warbler (*D. virens*) is an example.

Warblington, urban dist., Hampshire, England, 7 m. N.E. of Portsmouth. Has ruins of an ancient castle. Pop. (1911) 3,773.

Warburg, tn., Prussia, in Westphalia, on the Diemel, 35 m. w. of Göttingen. Pop. (1910) 5,683.

Warburton, BARTHOLOMEW ELLIOTT GEORGE, usually known as ELIOT WARBURTON (1810-52), Irish author, was born at Aughrim, Co. Galway, and busied himself with the management of his Irish property and with literary pursuits. He wrote *The Crescent and the Cross* (1844), *Memoirs of Prince Rupert* (1849), and *Darien, or the Merchant Prince* (1851). He developed a great passion for travel, and perished on the burning steamer *Amazon* while on his way to Panama.

Warburton, JOHN (1682-1759), English antiquary, was born in Lancashire, and appointed Somerset herald in the College of Arms (1720). He was a great collector, and it was an irreparable loss when his manuscript copies of Elizabethan plays were destroyed by fire, for most of them were unique copies. He prepared and issued a *Map of Northumberland* (1716), a *Map of Middlesex* (1749), and in 1753 *Vallum Romanum*, or the *History of the Roman Wall in Cumberland*, from his own surveys.

Warburton, SIR ROBERT (1842-99), British soldier, was of British and Afghan parentage. From 1879 until 1897 he was warden of the Khaibar Pass. His last service was with the Tirah expedition of 1897-8. See his *Eighteen Years in the Khyber* (1900).

Warburton, WILLIAM (1698-1779), English divine, was a native of Newark, and in 1727 he was

presented to the living of Brant-Broughton, Lincolnshire. In 1736 he published his *Alliance between Church and State*, which Bolingbroke fitly described as an attempt to rest a theory on a fiction. The first six books of the author's ambitious work, *The Divine Legation of Moses*, appeared in 1737-8, and another was issued in 1788. Its purpose is to refute the deistic assumption that the Mosaic economy, as it does not postulate the immortality of the soul, cannot be credited with divine authenticity. By his six letters to M. de Crousaz, containing his *Vindication of Pope's Essay on Man* (1740), Warburton won the gratitude and affection of Pope. His strenuous and redundant *Commentary on the Essay of Man* appeared in 1742. Pope made Warburton his literary executor. In 1746 Warburton was appointed preacher of Lincoln's Inn, and in three successive years (1753-5) he was prebendary of Gloucester, king's chaplain, and prebendary of Durham. In 1757 he became dean of Bristol, and in 1759 he was appointed bishop of Gloucester. In his *Doctrine of Grace* (1762) Warburton assailed Wesley, prompting retorts from both Wesley and Whitefield. To literature he contributed an unsatisfactory edition of Shakespeare (1747), a work on *Julian the Apostate* (1750), an annotated edition of Pope (1751), and *Lord Bolingbroke's Philosophy* (1756). *The Principles of Natural and Revealed Religion—Sermons* appeared in 3 vols. (1753-67). In 1768 Warburton sunk £500 to found the lecture on prophecy designated from his name, and afterwards delivered in Lincoln's Inn chapel. Warburton's works (7 vols.) were edited by Bishop Hurd (1788). See his *Literary Remains* (ed. F. Kilvert, 1841); *Life of Warburton*, by J. Selby Watson (1863).

Ward, ADOLPHUS WILLIAM (1837), English historian; became (1866) professor of history and English literature at Owens College, Manchester, and principal from 1890-7. He has also held the vice-chancellorship of Victoria University, which owes its existence partly to him. His election as master of Peterhouse, Cambridge, took place in 1900. Among his works are *The House of Austria in the Thirty Years' War* (1869); *History of English Dramatic Literature to the Death of Queen Anne* (1875 and 1899); *The Counter-Reformation*, in the Epochs of Church History Series; *Chaucer* (1880) and *Dickens* (1882), in the English Men of Letters Series; *The Electress Sophia and the Hanoverian Succession* (1903); an ed. of *Crabbe's Poems* (1905); and the Knutsford edition of the works of Mrs. Gaskell (1906).

Ward, ARTEMUS. See BROWNE, C. F.

Ward, EDWARD (1667-1731), English writer of humorous and satiric verse, was born in Oxfordshire, and settled down to keep a public-house in Moorfields, London. In consequence of the political bearings of his *Hudibras Redivivus*, he had to stand twice in the pillory (1705). Butler was his model, and the Low Church party the object of his profanity and revilings. His collected writings were issued in six volumes (1724).

Ward, EDWARD MATTHEW (1816-79), English genre and historical painter of the Victorian era, born in London. He studied in the Royal Academy schools, then for three years in Rome, and finally in Munich under Cornelius. On his return to England he painted *Cimabue and Giotto*; in 1845 he exhibited in the Academy his *Doctor Johnson in Lord Chesterfield's Ante-Room* (Tate Gallery, London); was elected A.R.A. in 1847, and R.A. in 1855, after receiving the commission to

paint eight frescoes for the House of Commons. One of his best-known works, *The South Sea Bubble* (Tate Gallery), was exhibited in 1847; *Marie Antoinette parting with the Dauphin* in 1856; and in 1859 *Marie Antoinette listening to her Act of Accusation*. See *The Life and Works of E. M. Ward* (1879), by T. Dafforne; *The English School of Painting* (1884), by E. Chesneau; and Mrs. E. M. Ward's *Reminiscences*, ed. by E. O'Donnell (1910).

Ward, SIR EDWARD WILLIS DUNCAN (1853), permanent under-secretary for war and secretary to the Army Council, was supply officer to Sir George White during the siege of Ladysmith, and it was mainly due to his skill and resource in providing provisions that the garrison was able to hold out until relief arrived. He joined the Army Service Corps in 1875, and took part in the Sudan expedition of 1885, when he was specially mentioned in dispatches. He also took part in the Ashanti campaign of 1895-6.

Ward, ELIZABETH STUART PHELPS (1844), American novelist and religious essayist, born at Andover, Massachusetts. In 1888 she married Herbert D. Ward. She has written for children and for adult readers—e.g. *The Gates Ajar* (1868); *Men, Women, and Ghosts* (1869); *The Silent Partner* (1871); *Poetic Studies* (1875); *The Story of Avis* (1877); *Sealed Orders* (1879); *Doctor Zay* (1882); *Beyond the Gates* (1883); *The Madonna of the Tuhs* (1886); *The Gates Between* (1887); *Come Forth* (1890), and *The Master of the Magicians* (1890)—the two last with Herbert D. Ward; *A Singular Life* (1894); *Within the Gates* (1901); *Avery* (1902); *Trixy* (1905); *Though Life Us Do Part* (1908); *The Oath of Allegiance* (1909); and others. See her *Chapters from a Life* (1896).

Ward, GENEVIÈVE (1838), American actress, was born at New York, U.S.A. Previous to her appearance on the dramatic stage she won distinction as an operatic singer, and made her début in that capacity in 1856 under the name of Ginevra Guerabella. In 1873 she appeared as Lady Macbeth at the Theatre Royal, Manchester. In 1879 she produced the play *Forget-me-not*, and subsequently toured with it all over the world. After that she acted with Sir Henry Irving at the Lyceum in *Becket*, *King Arthur*, and *Richard III*. In 1855 she married the Count de Guerbel.

Ward, HARRY MARSHALL (1854-1906), English botanist; was educated at Owens College, Manchester, and Christ's College, Cambridge. He became professor of botany in Forest School, Cooper's Hill, in 1885, and from 1895 till his death was professor of botany in the University of Cambridge. He especially devoted himself to cryptogamic and physiological botany, and took great interest in the establishment of the botanical laboratory at Cambridge. His works include *Timber, and some of its Diseases* (1889); *The Oak* (1892); *Grasses* (1901); *Disease in Plants* (1901); and *Trees* (1904-5).

Ward, MRS. HUMPHRY, née MARY AUGUSTA ARNOLD (1851), English novelist, granddaughter of Dr. Arnold of Rugby, was born at Hobart in Tasmania, and married (1872) Mr. Humphry Ward. After publishing a translation of Amiel's *Journal Intime* (1885), she attracted attention by *Robert Elsmere* (1888), a suggestive work on present-day spiritual problems in the form of a novel. This has been followed by *David Grieve* (1892); *Marcella* (1894); *Sir George Tressady* (1896); *Helbeck of Bannisdale* (1898); *Lady Rose's Daughter* (1903); *The Marriage*

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was born in London; and in 1833 invented the Wardian case for the transmission of growing plants. The Cavendish banana was introduced into Fiji and Samoa, and tea and cinchona into Assam, by its means. Ward published *On the Growth of Plants in closely-glazed Cases* (1842). See **WARDIAN CASES**.

Ward, THOMAS HUMPHRY (1845), English author, was born at Hull; was elected a fellow of Brasenose College, Oxford (1869). He is on the staff of the *Times*. He is joint-author of a monograph on *Romney* (1904), and editor of *The English Poets* (1881-2), of *English Art in the Public Galleries of London* (1888), of the *Reign of Queen Victoria* (1887), of *Men of the Reign* (1885), and of *Men of the Time* (12th ed.).

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Ward, WILLIAM GEORGE (1812-32), English theologian and controversialist, was born in London. He was the philosopher of the Oxford movement, though at first antinominarian, being attracted on one side by Mill and Comte, and on the other by Newman. He published in 1844 his *Ideal of a Christian Church*. He was received into the Roman Catholic Church the following year, and for many years lectured in the Catholic college of St. Edmund's, Ware. He was editor of the *Dublin Review* from 1863-78.

Warden. The Warden of the Cinque Ports has the authority of an admiral, and formerly exercised jurisdiction in proceedings at law and in equity. In old times the Warden of the Marches guarded the frontiers or marches of Wales and Scotland. The Warden of the Standards is the official who has the custody of the imperial standards of length, weight, etc., by an Act of 1866. The name is also given to the heads of certain public schools and university colleges.

Wardha, chief tn., Wardha dist., Central Provinces, India, 46 m. s.w. of Nagpur. It is an entrepôt for cotton. Pop. 10,000. The district has an area of 2,420 sq. m., and a pop. of 390,000.

Wardian Cases are close, glazed cases, some kinds of which are used for packing pot plants that have to travel long sea voyages, others being used for the cultivation of plants in rooms. Wardian cases are also used in the cultivation of ferns that require a very moist atmosphere. Some of the more delicate filmy ferns (e.g. *Trichomanes* and *Hymenophyllum*) luxuriate vigorously in these miniature plant-houses.

Wardlaw, ELIZABETH, LADY (1677-1727), Scottish poetess, wrote *Hardyknute* (1719), the secret of the authorship of which was not divulged till Percy published the second edition of the *Reliques of Ancient Poetry*. With doubtful justification *Sir Patrick Spens*, *The Douglas Tragedy*, and other Scottish ballads, have been attributed to her.

Wardlaw, RALPH (1779-1853), Scottish divine, was born at Dalkeith; joined the Congregational body, and settled in Glasgow. He ultimately became professor of theology in the divinity school of the denomination in Scotland, and took a prominent part in public affairs,

Ward, GENEVIÈVE (1838), American actress, was born at New York, U.S.A. Previous to her appearance on the dramatic stage she won distinction as an operatic singer, and made her début in that capacity in 1856 under the name of Ginevra Guerabellia. In 1873 she appeared as Lady Macbeth at the Theatre Royal, Manchester. In 1879 she produced the play *Forget-me-not*, and subsequently toured with it all over the world. After that she acted with Sir Henry Irving at the Lyceum in *Becket*, *King Arthur*, and *Richard III*. In 1855 she married the Count de Guerbel.

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Ward, THOMAS HUMPHRY (1845), English author, was born at Hull; was elected a fellow of Brasenose College, Oxford (1869). He is on the staff of the *Times*. He is joint-author of a monograph on *Romney* (1904), and editor of *The English Poets* (1881-2), of *English Art in the Public Galleries of London* (1888), of the *Reign of Queen Victoria* (1887), of *Men of the Reign* (1885), and of *Men of the Time* (12th ed.).

Ward, WILFRID PHILIP (1856), English writer, editor of *The Dublin Review*, born at Ware; became lecturer in philosophy at Ushaw College, Durham (1890). He has published *The Wish to Believe* (1884), *The Cloths of Religion* (1886), *William George Ward and the Oxford Movement* (2nd ed. 1890), *Witnesses to the Unseen* (1894), *The Life and Times of Cardinal Wiseman* (1897), *Problems and Persons* (1903), *Aubrey de Vere: a Memoir* (1904), *Ten Personal Studies* (1908), and *Life of Newman* (1912).

Ward, WILLIAM GEORGE (1812-82), English theologian and controversialist, was born in London. He was the philosopher of the Oxford movement, though at first latitudinarian, being attracted on one side by Mill and Comte, and on the other by Newman. He published in 1844 his *Ideal of a Christian Church*. He was received into the Roman Catholic Church the following year, and for many years lectured in the Catholic college of St. Edmund's, Ware. He was editor of the *Dublin Review* from 1863-78.

Warden. The Warden of the Cinque Ports has the authority of an admiral, and formerly exercised jurisdiction in proceedings at law and in equity. In old times the Warden of the Marches guarded the frontiers or marches of Wales and Scotland. The Warden of the Standards is the official who has the custody of the imperial standards of length, weight, etc., by an Act of 1866. The name is also given to the heads of certain public schools and university colleges.

Wardha, chief tn., Wardha dist., Central Provinces, India, 46 m. s.w. of Nagpur. It is an entrepôt for cotton. Pop. 10,000. The district has an area of 2,420 sq. m., and a pop. of 390,000.

Wardian Cases are close, glazed cases, some kinds of which are used for packing pot plants that have to travel long sea voyages, others being used for the cultivation of plants in rooms. Wardian cases are also used in the cultivation of ferns that require a very moist atmosphere. Some of the more delicate filmy ferns (*e.g.* Trichomanes and Hymenophyllum) luxuriate vigorously in these miniature plant-houses.

Wardlaw, ELIZABETH, LADY (1677-1727), Scottish poetess, wrote *Hardyknute* (1719), the secret of the authorship of which was not divulged till Percy published the second edition of the *Reliques of Ancient Poetry*. With doubtful justification *Sir Patrick Spens*, *The Douglas Tragedy*, and other Scottish ballads, have been attributed to her.

Wardlaw, RALPH (1779-1853), Scottish divine, was born at Dalkeith; joined the Congregational body, and settled in Glasgow. He ultimately became professor of theology in the divinity school of the denomination in Scotland, and took a prominent part in public affairs,

notably the anti-slavery movement. See *Life* by W. L. Alexander (1856).

Wardle, urban dist., S.E. Lancashire, England, immediately N.E. of Rochdale. Pop. (1911) 4,720.

Wardmote, the court of each ward of the City of London, presided over by the alderman of the ward. Wardmotes are held on St. Thomas's Day (December 21) for the election of common councillors. The wardmote also nominally inquires into the good conduct of the ward. See Pulling's *Laws and Customs of London* (1854).

Wardroom, the common mess-room of the commissioned officers, excluding the captain, in a man-of-war; originally the room over the gunroom, where the lieutenants and other officers messes and slept. In 1808 masters, surgeons, and pursers were given the title of warrant officers of wardroom rank, and were thus differentiated from the boatswain, gunner, and carpenter. With the establishment of naval instructors, and of engineers, in 1837, these two classes were added to the list of officers of wardroom rank.

Wardship, the right of guardianship, which was one of the incidents of feudal tenure.

Ware. (1.) Urban dist., Herts, England, on Lea, 2 m. N.E. of Hertford. The 'great bed of Ware,' referred to by Shakespeare, has been removed to Rye House. There are malt works. Pop. (1911) 5,842. (2.) Town, Hampshire co., Massachusetts, U.S.A., on the Ware, 23 m. w. of Worcester; has manufactures of cotton and woollen goods, paper, boots and shoes. Pop. (1910) 8,774.

Wareham, munic. bor., Dorsetshire, England, on Frome, near Poole harbour, and noted for lime, clay, and cement; ancient earthworks nearly surround the town.

The old church of St. Mary was the first burial-place of Edward the Martyr. Pop. (1911) 2,002.

Warehousing. See BONDED WAREHOUSE.

Waren, tn. in Mecklenburg-Schwerin, Germany, 20 m. N.W. of Neustrelitz, on the N. shore of the Müritz See. Pop. (1910) 9,134.

Warendorf, tn. in Westphalia, Prussia, on the Ems, 15 m. E. of Münster; manufactures linen. Pop. (1910) 7,002.

Wargla. See OUARGLA.

Warham, WILLIAM (?1450-1532), archbishop of Canterbury, was born in Hampshire. He was created master of the rolls (1494), lord chancellor (1503), and archbishop in the same year. He was not in such great favour with the new king, Henry VIII., and was supplanted by Wolsey (1515). He was a supporter of the new learning, but though he accepted 'royal supremacy,' was hostile to the reformation of the church. See Hook's *Lives of the Archbishops* (1868).

Warkworth, vil., Northumberland, England, on Coquet, 7 m. S.E. of Alnwick. The castle, founded in 12th century, has a remarkable 15th-century keep. Near the river is an ancient hermitage excavated in the solid rock. Pop. 720.

War Medals and Clasps. See MEDAL.

Warming. See HEATING.

Warminster, urban dist. and mrkt. tn., Wilts, England, 9 m. S. of Trowbridge, on W. border of Salisbury Plain; manufactures silk and agricultural implements. In the district are many ancient remains. Pop. (1911) 5,492.

Warner, CHARLES (1846-1909), English actor, made his début at Windsor Castle in 1861 in *Richelieu*, produced by Phelps. Among Warner's notable impersonations were Harry Dornton in *The Road to Ruin*, Charles Surface, Badger in *The Streets of London*,

Michael Strogoff in *The Courier of the Tzar*, **Charles Middlewick** in *Our Boys*, and **Monsieur Garnier** in *Leah Kleschna*. Of his Coupeau, in Reade's version of Zola's *L'Assommoir* ('Drink'), Coquelin asserted that it was 'one of the finest dramatic efforts ever seen on the stage.' His daughter, Grace Warner, excels as an actress in a wide range of parts.

Warner, CHARLES DUDLEY (1829-1900), American man of letters, born at Plainfield, Massachusetts. After practising law for several years in Chicago he turned to literature. He wrote: *My Summer in a Garden* (1870), *Saunterings* (1872), *Back-Log Studies* (1872), *Baddeck and That Sort of Thing* (1874), *In the Levant* (1877), *Being a Boy* (1877), *Life of Captain John Smith* (1881), *Life of Washington Irving* (1881), *Their Pilgrimage* (1886), *A Little Journey in the World* (1889), *The Golden House* (1894). He also edited a *Library of the World's Best Literature* (1897).

Warner, SUSAN (1819-85), American authoress, wrote under the *nom de plume* of Elizabeth Wetherell a series of tales, of which the best known is *The Wide, Wide World* (1851). Her other works include *Queechy* (1852), *The Hills of Shatemuc* (1856), *Melbourne House* (1866), and *Little Annette* (1874). Her forte was the domestic story, with a liberal admixture of pathos and sentiment, on the merits of which opinions necessarily differ. See *Life* by her sister, Anna B. Warner (1909).

Warner, WILLIAM (?1558-1609), English poet, born in London; became an attorney, but was more prominent as a man of letters. His principal work was *Albion's England* (1586), a metrical British history from Noah to the Norman conquest, afterwards extended to 1606. He

also wrote *Pan his Syrinx* (1585), and translated the *Menæchmi* of Plautus (1595).

Warning Coloration is for the purpose of making an animal conspicuous and readily recognizable by its enemies, so that it may be avoided. The characteristic is usually associated with some unpleasant qualities, such as a bad odour or a nauseous taste; or with dangerous powers, as the possession of a sting or a poison fang; or even with appearance only, as in the case of some lizards and insects. Instances of warning coloration are specially prominent among the Felidae, Reptilia, and Insecta. See COLOURS OF ANIMALS.

Warnsdorf, tn., Bohemia, Austria, on the frontier of Saxony, 40 m. E. by S. of Dresden; has important textile industries. Pop. (1911) 23,220.

War Office. The War Office in Whitehall is the home of the Army Council and of the headquarters staff. (For general principles of army control, see ARMY, BRITISH.) At the head of it is the secretary of state for war. He is assisted by a military secretary, who is responsible for the clerical and executive duties connected with promotion, retirement, and the higher staff appointments. In this connection it may be mentioned that the secretary of state is personally responsible for all appointments down to that of general staff officer, second grade. Each military member of the Army Council is assisted by directors, those of the general staff being for operations, staff duties, and training. Those of the adjutant-general are for organization, personal services, and medical services. Those of the quartermaster-general for transport and remounts, veterinary service, moves and quarterings, supplies, equipment, and ordnance stores. The master-general of the ord-

nance has directors for artillery, for fortifications and works, and for barrack construction. The above completes the purely military side of the War Office. There is also an important civil side, staffed in great measure by successful candidates at the civil service examinations. The parliamentary under-secretary of state is usually termed the civil member (of the Army Council). Under him are the director-general of the Territorial Force and a comptroller of lands. He is responsible for the construction of new barracks, for the chaplain's department, and for the non-effective votes. The financial secretary, or finance member, is responsible for all details of army expenditure, and corresponds direct with the major-generals in charge of administration. He also supervises all contracts. He is the channel of communication with the Treasury, which, as it happens, is nearly always responsible for the sordid but necessary economies attributed by the press to the War Office and the Army Council. His directors are for army accounts, for financial services, and for contracts. The permanent under-secretary of state, or secretary of the War Office, is responsible for all interior economy. He is also secretary to the Army Council. He supervises the preparation and preservation of parliamentary and other correspondence, and the preparation of actuarial and statistical returns. Among many other items, he controls the general registry, which records, distributes, and, if necessary, retains all office correspondence; the printing and stationery departments; the parliamentary library; and all civilian personnel. A second military library is controlled by the general staff. The estimate for 1910-11 amounted to £429,000, an apparent decrease of

£164,000, which is more than accounted for by the transference of £265,000 from the Army Accounts Department to the Army Pay Department and Pay Corps. These latter draw only £11,000 less in another vote.

Warora, munic. tn., Chanda dist., Central Provinces, India, 65 m. s.w. of Nagpur; with coal mines and an important cotton industry. Pop. 11,000.

Warping. (1.) A mode of increasing the fertility of land along the banks of rivers liable to overflow, by allowing them to deposit their mud, called 'warp,' upon the surface overflowed. (2.) To warp a ship into harbour, or to her berth, is to move her by hauling on a rope which has been fastened to something fixed.

Warracknabeal, tn., Victoria, Australia, in Borung co., 172 m. N.W. of Melbourne, in an agricultural and pastoral district; has implement and carriage factories and flour mills. Pop. 2,600.

Warrandice, in Scots law, an obligation or guarantee given by the granter of property that it will not be taken from the grantee by any one having a preferable title. In real warrandice one piece of land is given in security against eviction from the other. Personal warrandice is of three kinds—(1.) Simple, which secures the grantee from eviction arising out of future deeds of the granter. (2.) Warrandice from fact and deed, which secures the grantee from eviction arising out of any deed, past or future, of the granter. (3.) Absolute warrandice, which protects the grantee against eviction on any ground existing in his right before the grant was made.

Warrant, a written authority from one person to another to do or receive something. The term has been confined in practice to (1) warrants of the sovereign under the sign-manual: (2) war-

rants issued by government departments (hence a warrant officer); (3) warrants to arrest or to search, but general warrants are illegal—that is to say, the name of the person to be arrested must be inserted in the warrant; (4) dock and dividend warrants, authorizing the delivery of goods out of bond, or the payment of dividends.

Warrant of Attorney, a written authority to an attorney to appear in court for the person giving the warrant and confess judgment, or allow judgment to go by default, in an action brought by or against that person. Warrants of attorney are subject to 32 and 33 Vict. c. 62, which makes provisions as to their form and validity.

Warrant Officers, NAVAL, officers who receive their rank by virtue of warrant as opposed to commission. Formerly there were a number of 'standing officers' who held warrants, and these included some who received their warrant from the Admiralty—i.e. the master and the surgeon—and others who received their warrant from the Navy Office—i.e. the gunsmith, master-at-arms, and sailmaker. These officers retained their appointments after their ships were paid off. Their chief duties, when not at sea, were to look after the stores of their various departments. Among the warrant officers of Pepys's time was the purser, who purchased his warrant. The gunner, boatswain, and carpenter in the days of the sailing navy were, as at present, warrant officers, but above them were the master and his mates, who, not until nearly the middle of the 19th century, with the purser, received commissions. The boatswain was formerly superior to the gunner in rank. With the introduction of steam the engineer was included, though

engineers have long since been given commissions. Cadets and midshipmen, known as subordinate officers, are still appointed by warrant, and are not commissioned until they are promoted to be sub-lieutenants.

MILITARY.—This rank is the intermediate step between the rank and file and a commission. The senior warrant officer of the army is the conductor of the Army Ordnance Corps, and receives pay at the rate of six shillings per day. Then in order come the following—staff sergeant-majors, master-gunners, corporal-majors of the household cavalry, bandmasters, and schoolmasters. No soldier below the rank of sergeant is eligible for promotion to warrant rank, except as bandmaster.

Warranty. By the Sale of Goods Act, 1893, a warranty is defined as 'an agreement with reference to goods which are the subject of a contract of sale, but collateral to the main purpose of such contract, the breach of which gives rise to a claim for damages, but not a right to reject the goods and treat the contract as repudiated.' It is always a question of construction whether a stipulation is to be read as a warranty or as a condition; but a buyer may elect to treat the breach of a condition as a breach of warranty. When the contract is in writing, evidence of a verbal warranty or condition is inadmissible. Warranties are either express or implied. In a contract of sale there is an implied warranty that the buyer shall have quiet possession, and that the goods are free from encumbrances; and an implied warranty that the goods are fit for a particular purpose may be annexed by the usage of trade. The following conditions are also implied:—that the goods correspond with their description or sample; that

if to the knowledge of the seller the goods are sold for a specific purpose, the goods are fit for that purpose; that goods bought by description are of merchantable quality, if they have not been examined; and that goods bought by sample are free from defects undisclosed by the samples. On the sale of a horse there is no implied warranty that it is sound. In a contract for the hire of a specific chattel—as, for example, a particular steam tug—there is no implied warranty of its fitness for the purpose it is to be used for; but there is in the case of chattels not specific—for example, when a job-master lets a carriage. In policies of insurance and in charter parties the word ‘warranty’ is used in the sense of ‘condition.’ In the case of chain cables a warranty that the cable has been legally tested and stamped is implied (Chain Cables and Anchors Act, 1874).

Warraus, or GUARRAUNOS, the aborigines of the Guiana seaboard, who were mostly driven out by the intruding Caribs and Arawaks, and only a few small groups now survive on the coast of British and Dutch Guiana. In this watery domain they live in frail, leafy huts, raised on piles or in the branches of trees high above the periodical floods, and occupied almost exclusively with fishing. They speak a stock language unrelated to any other.

Warren. In England a right of warren or free warren is a franchise obtained by royal grant or prescription, and may either be appurtenant to the land to which it applies, or be owned in gross as an incorporeal hereditament. It is a right of property in certain kinds of game, and the beasts and birds to which it applies are hares, rabbits, roes, partridges, pheasants, woodcock, quails, rails, mallards, and herons, and perhaps some others, but not

grouse. In ordinary non-legal language a warren is a breeding-place for rabbits. See FOREST.

Warren. (1.) Town, cap. of Trumbull co., Ohio, U.S.A., on the Mahoning, 53 m. S.E. of Cleveland; has machine shops, rolling mills, and flour mills, and manufactures electrical supplies; coal and iron are mined. Pop. (1910) 11,081. (2.) Town, cap. of Warren co., Pennsylvania, U.S.A., on the Allegheny, 50 m. E.S.E. of Erie; has oil-refining, engine and boiler making, and piano factories. Pop. (1910) 11,080. (3.) Town, Rhode Island, U.S.A., in Bristol co., 9 m. S.E. of Providence. There is a good harbour, and iron-founding, cotton-spinning, and rope-making are carried on. Pop. (1910) 6,585.

Warren, SIR CHARLES (1840), British general, born at Bangor in N. Wales. He was special commissioner for the settlement of the boundary between the Orange Free State and Griqualand West (1876-7), and his impressions of those countries and their peoples were recorded in his *On the Veldt in the Seventies* (1902). He held the command of the Diamond Fields Horse in the Kaffir war (1877-8), and of part of the Griqualand West Field Force in the Griqua rising (1878). He brought to justice the murderers of Professor Palmer and his party during the Egyptian war (1882), and conducted successfully the Bechuanaland expedition (1884-5). From 1886-8 he was Chief Commissioner of the Metropolitan Police. On the outbreak of the Boer war he went out to S. Africa in command of the Fifth Infantry Division, and in the second attempt to raise the siege of Ladysmith crossed the Tugela (Jan. 18, 1900), attacked the Boers' right flank on the 21st, and on the 23rd captured Spion Kop. The position was held during the 24th, but

after severe fighting and heavy British losses, was evacuated in the early hours of the 25th. Lord Roberts subjected Warren's action to severe criticism. In 1867-70 Warren was engaged on excavation work at Jerusalem and in Palestine, and in that connection wrote *Underground Jerusalem* (1874), *The Temple or the Tomb* (1880), *Jerusalem* (1884). He has also published *The Ancient Cubit and our Weights and Measures* (1903).

Warren, GOUVERNEUR KEMBLE (1830-82), American general, born at Cold Spring, New York; was assistant professor of mathematics at West Point (1859-61), and in the civil war was engaged in the battles of Manassas, Antietam, Fredericksburg, Chancellorsville, and Gettysburg; commanded at Auburn and Bristol, and distinguished himself in the Richmond campaign and the siege of Petersburg. He wrote *Explorations in the Dakota Country* (1856), and *Explorations in Nebraska* (1858).

Warren, SIR JOHN BORLASE (1753-1822), British naval officer, saw service with Howe and Sir Charles Hardy in N. America. On April 23, 1794, a force under his command captured the *Pomone*, the *Babet*, and the *Engageante*. In 1796 he kept the whole Atlantic coast of France in alarm, and captured, drove ashore, or destroyed numerous vessels. In 1798 he was instrumental in annihilating a French expeditionary squadron designed for Ireland. In 1806 he captured the *Marengo* and the *Belle Poule*. He became a full admiral in 1810.

Warren, LEICESTER. See DE TABLEY.

Warren, SAMUEL (1807-77), Welsh novelist, born in Denbighshire; was called to the bar in 1837. He became Queen's Counsel (1851), and recorder of Hull (1854-74), and for a short period (1856-9) sat in the House of

Commons. His best-remembered works appeared first in *Blackwood's Magazine*—viz. *Passages from the Diary of a late Physician* (1832), and *Ten Thousand a Year* (1841). Other works are *Now and Then* (1847), and *The Lily and the Bee* (1851).

Warrenpoint, par., seapt. tn., and wat.-pl., Co. Down, Ireland, 7 m. S.E. of Newry, on the N. shore of Carlingford Lough. Pop. 1,800.

Warrensburg, city, Missouri, U.S.A., co. seat of Johnson co., 52 m. E.S.E. of Kansas City. It is situated in an agricultural region, and has quarries and flour mills. Pop. (1910) 4,689.

Warrington, munic., parll., and co. bor., Lancashire, England, on the Mersey, between Manchester and Liverpool, and just N. of the Manchester Ship Canal. The church of St. Elphin occupies the site of a 12th-century structure, and has a Saxon crypt. The town has iron manufactures, cotton mills, soap, glass, and chemical works, and a large tanning industry. Pop. (1911) 72,178.

Warrior, a British armoured cruiser of 13,550 tons, launched at Pembroke in 1905.

Warrnambool, seapt. tn., Villiers co., Victoria, on Southern Ocean, 166 m. S.W. of Melbourne; is the third port in the state, and the terminus of the railway from Geelong. Pop. 6,700.

Warsaw. (1.) Government, Russian Poland, between Siedlce on E. and Prussia on W. Area, 6,750 sq. m. The surface is almost level. The whole government belongs to the Vistula basin, largely through the W. Bug. Marshes are extensive in the centre. The chief mineral deposit is salt. Fruit culture is active. In 1910, 53,805 acres were under beet cultivation, the production of sugar being 3,777 tons. Industrially, Warsaw

ranked second in Russian Poland. The larger industrial establishments include sugar-refineries, steel and other metal works, tanneries, distilleries, breweries, flour mills, and factories of tobacco, soap, and candles, and of cloth, silk, and flax stuffs of all kinds. Trade is very active. Of the population, 75 per cent. are Roman Catholics and Poles, 16 per cent. Jews, 7 per cent. Protestants (mostly Germans). Pop. 2,410,000. (2.) City, cap. of gov. of same name, Russian Poland, formerly capital of kingdom of Poland, mainly on l. bk. of Vistula, 320 m. E. of Berlin. It is the residence of the governor-general of Poland; has a fortress and large garrison. The Casimir Palace is occupied by the university, which is attended by over 800 students, and has a library of some 550,000 volumes. Iron and steel goods, machinery, carriages, plated goods, artificial flowers, chemicals, chocolate, cigarettes, gold and silver ware, glass, india-rubber, surgical and musical instruments, and boots and shoes are manufactured. Trade is carried on in grain, leather, sugar, and coal; the wool and hop fairs are important. Warsaw was the residence of the dukes of Mazovia till 1526. In 1609 it superseded Cracow as the capital of Poland. It was taken by the Swedes in 1655 and 1656, and was captured by the Russians in 1764 and 1794. In 1807 it was made capital of the duchy of Warsaw, and in 1813 came entirely under Russian rule. After an insurrection lasting from Nov. 29, 1830, to Sept. 8, 1831, Warsaw capitulated. The city was the scene of much rioting and bloodshed during the Russian upheaval of 1905-6. Pop. 783,000 (about one-third Jews).

Warsop, urban dist., England, co. of and 17 m. N. of Nottingham. Pop. (1911) 4,224.

War Stores Commission.

The publication of the Butler War Office Committee Report on Sales and Refunds to Contractors in Africa at the end of the war led to the appointment of a royal commission to investigate the whole of the circumstances. The report (1906) was to the effect that, though no charges of corruption or fraud could be sustained, the conduct of certain officers was open to grave suspicion, and was 'contrary to the spirit and letter of the King's regulations.' As a consequence, several were censured, others retired, and one was removed from the army.

Wart, or VERRUCA, a papillary outgrowth from the skin, sometimes due to the debility of youth or old age, and frequently associated with dirt and neglect. A wart consists of enlarged vascular papillae, each enclosed in a sheath of thickened cuticle. It is usually sessile, but upon the scalp is often pedunculated. On the fingers warts are generally isolated and large; on the wrists, hands, and scalp they are apt to develop in crops. In elderly people a simple wart sometimes becomes a centre of malignant disease. Each wart may be painted with acetic acid daily, or touched with a saturated solution of caustic potash. When large crops of warts are present, tonics and liquor arsenicalis should be given internally. In all cases cleanliness is of importance.

Wartburg. See EISENACH.

Warthe, or WARTA, riv. of Russian Poland and Germany, rises in the s.w. of Piotrków gov., Poland, and flows generally n.w., with many windings, to the Oder at Küstrin. Its length is about 450 m., of which 250 m. are navigable.

Wart-hog (*Phacochoerus*), a genus belonging to the pig family, with two species, peculiar to Africa. The wart-hogs

are characterized by their very large heads, which bear large wartlike processes at the sides. The tusks are greatly developed, those of the upper jaw being considerably larger than those of the lower. In the young there are thirty-four teeth; but in the adults the incisors and anterior cheek teeth tend to disappear, leaving only the large tusks and the last molar in each side of each jaw. This last molar, however, becomes greatly enlarged, and is of exceedingly complex structure. In habits the wart-hogs resemble pigs. Two species are known—*P. africanus*, widely distributed over the continent; and *P. Pallasi*, confined to S.E. Africa.

Warton, JOSEPH (1722-1800), English poet and critic, was born at Dunsfold, Surrey. He and Collins projected a joint collection of odes, but in fact published their works separately—Warton (1746). Warton's verses *To Evening*—'Hail, meek-eyed maiden!'—are now perhaps the only lines of his that are remembered. After holding some livings he went to Winchester as second master, and was headmaster (1766-93). Both in his *Odes* and in an *Essay on Pope* (1756) he vindicated the claims of the imaginative poetry of the Elizabethans and of Milton. These views he repeated later in his edition of *Pope* (1797). He is also known as one of the many editors and translators of Virgil. See Woolf's *Life* (1806).

Warton, THOMAS (1728-90), brother of Joseph, born at Basinstoke, and became fellow of Trinity College, Oxford. Mason having attacked the University of Oxford in *Isis, an Elegy*, Thomas Warton replied (1749) with the *Triumph of Isis*, with taste, spirit, and success. His merit is that of the pioneer. Like Gray, he fixed his ultimate choice upon the wild and the ro-

mantic; he resembled Gray, also, in his passion for mediæval research. The spirit of romanticism was, in fact, reviving: Warton's *History of English Poetry* (1774-81) gave it a fresh impulse, in conjunction with Percy's *Reliques*. Warton had published his *Observations on the 'Faerie Queene' of Spenser* in 1754; and in 1757 he was appointed professor of poetry at Oxford, and held the office for the usual term of ten years. Of his professorship the *Dissertation on Theocritus*, prefixed to his edition of the poet, was the only fruit. He was poet laureate from 1785 to his death. He wrote the biographies of Sir Thomas Pope and Lord Bathurst. He was a friend of Johnson and his circle; yet between him and Johnson there grew up an estrangement. See Mant's *Life* (1802).

Warwick. (1.) Munic., parl. (with Leamington), and co. bor., Warwickshire, England, on the Avon, 21 m. S.E. of Birmingham. Agricultural implements and gelatin products are manufactured. The town ranked as a borough from the time of Edward the Confessor. At Blacklow Hill, in the vicinity, Piers Gaveston was beheaded in 1312. The fine baronial castle, situated on a rocky eminence (Guy's Cliffe) above the Avon, is said to have been founded by Elfreda, daughter of King Alfred. It was mainly rebuilt, in the time of Edward III., by Beauchamp, Earl of Warwick, and his son. In 1642 it was unsuccessfully attacked by the royalists. It contains valuable art collections, including works by Rubens and Van Dyck. An annual pageant is held representing episodes in English history associated with the town. Pop. munic. bor. (1911) 11,858. (2.) Town, Kent co., Rhode I., U.S.A., on Narragansett and Cowes Bays, 12 m. S.W. of Providence; has manufacture of cotton, silk, and woollen goods. Pop. (1910) 26,629.

(3.) Town, Queensland, 166 m. s.w. of Brisbane by rail, on the Condamine R. Wine-making, bacon-curing, tanning, flour-milling, coal-mining, and cheese-making are carried on. Pop. 4,000.

Warwick, GUY OF. See GUY OF WARWICK.

Warwick, RICHARD NEVILLE, EARL OF (1428-71), known as the 'king-maker.' His father was Richard Neville, Earl of Salisbury (1400-60), and he married Anne, daughter and heiress of Richard de Beauchamp, Earl of Warwick, and was himself created Earl of Warwick (1449). To his position as a member of the powerful family of the Nevilles, and to the prestige of great landed possessions, Warwick added the personal advantage of a winning presence and unusual talents. In 1455 he joined the forces of the Duke of York, and contributed greatly to the victory at St. Albans. He was rewarded with the governorship of Calais, and shortly after with the command of the seas. In 1459 Warwick was again fighting for York. Worsted in Kent, he retired to Calais; but in June 1460 he was back in Kent, with thousands flocking to his standard, and combining forces with Edward Earl of March, he again prevailed, and Edward was proclaimed king at London on March 4. During the next few years Warwick steadily subdued the strongholds which still held by the house of Lancaster. He conducted Henry a prisoner to the Tower in June 1465. The next year an insurrection in Yorkshire and the defeat of the royal forces at Edgecote threw King Edward into Warwick's hands. But the barons compelled him to liberate the king, and a temporary reconciliation followed. In 1470 the quarrel broke out afresh, and again was patched up. But shortly after Warwick

entered into a compact with the Lancastrian queen, Margaret, and landed at Plymouth, where he proclaimed Henry VI. king. Edward escaped to Holland, and Henry was triumphantly crowned at St. Paul's. Warwick was now for a few months supreme. But Edward landed on Mar. 14, 1471, at Ravenspur, gathered an army, and at the battle of Barnet Warwick was slain. See Oman's *Warwick* (1891).

Warwickshire, midland co., England. Surface diversified, but with no great elevations (Broom Hill, 830 ft.). The principal rivers are the Avon, Stour, and Tame. A large area is under pasturage. Coal is extensively mined, and there are quarries of diorite (Atherston, Nuneaton) and limestone. The manufactures include heavy iron goods, hardware, firearms, jewellery, etc. (Birmingham), ribbons, watches, bicycles, motor cars (Coventry). The county returns four members to Parliament. In the N. part of the county was the former Forest of Arden. Ancient roads are Watling Street on N.E., Foss Way, and Icknield Street. Area, 979 sq. m. Pop. (1911) 1,024,196. See *Victoria County History—Warwickshire*.

Wasatch. See WAHSATCH MTS.

Wash, THE, estuary, E. coast of England, between Lincoln and Norfolk, receives the Witham, Welland, Nen, and Ouse. It is beset by numerous sandbanks, dry at low water, between which are the intricate channels of the rivers. The shores are low and at times inundated. Length, 22 m.; breadth, 15 m. In 1751 Nathaniel Kinderley proposed to unite (1) the Welland and the Witham, and (2) the Nen and the Great Ouse, and to make the former empty, by means of a new channel, at Wrangle or Friskney, and the latter, by a

similar channel, at Snettisham. By this it was expected that some 100,000 ac. would be reclaimed. Sir John Rennie advocated that the four rivers should be united into one common channel, and the land be embanked as it 'accreted.' This was expected to give 150,000 ac. About 1850 the Norfolk Estuary Company began the reclamation of 30,000 ac. at the mouths of the Ouse and the Nen, and in 1851 the Lincolnshire Estuary Company began to reclaim other 30,000 ac. between the Witham, Welland, and Nen.

Washburn, CADWALLADER GOLDEN (1818-82), American soldier and politician, was born at Livermore, Maine. He sat in Congress in 1855-61 and 1867-71. During the civil war he served under Curtis at Grand Coteau; was major-general of volunteers at Vicksburg; commanded the 13th corps in Texas—capturing Fort Esperanza on Matagorda Bay (1863)—and the war district of Tennessee (1864-5). Prospering as a flour-miller (Minneapolis) and lumberer, he founded Washburn Observatory (Wisconsin university, 1873).

Washburne, ELIHU BENJAMIN (1816-87), American statesman and diplomatist, was secretary of state in Grant's first cabinet (1869); represented his country at Paris in the Franco-German war; sat in Congress sixteen years from 1853, winning a reputation as a keen economist, and styled 'the watchdog of the treasury.' He refused to run for president (1880), and wrote *Recollections of a Minister to France* (1869-77), *History of the English Settlement in Edwards Co., Illinois* (1882), and *The Edwards Papers* (1884).

Washhouses. See BATHS AND WASHHOUSES ACTS, and LAUNDRIES.

Washington, state in extreme N.W. of the United States, or-

ganized as a territory in 1853, and admitted as a state in 1889. It has an area of 69,127 sq. m., of which 2,291 sq. m. are water, and borders on the Pacific Ocean on the W. It is divided by the summit of the Cascade Range (6,000-7,000 ft.) into two unequal parts, differing widely in climate and vegetation. Upon and near the range rise volcanic cones—e.g. Mts. Baker (10,827 ft.), Rainier (12,363 ft.), Adams (12,470 ft.), Glacier Peak (10,436 ft.), and St. Helens (10,000 ft.). West of the Cascades is a depression or valley, occupied in the N. by Puget Sound, while the S. is drained by several streams. Separating this valley from the Pacific coast are the Coast Ranges. In the S. these are low; but between Puget Sound and the coast they rise into the Olympic Mts., whose highest summit, Mt. Olympus, reaches an altitude of 8,150 ft. Both this group and the Cascade Range contain many small glaciers. The northern part of the country E. of the range is mountainous. The central and southern parts consist of the great plain of the Columbia. In the western part of the state the rainfall ranges from 50 to 100 in. annually, and it is in consequence covered with dense, magnificent forests of Coniferæ. Trees of from 12 to 15 ft. in diameter, and 300 ft. in height, are not uncommon. The lumber mills are situated mainly upon the shores of Puget Sound. The eastern part has a light rainfall. The principal river of Washington is the Columbia, which enters it on the N. from British Columbia. The Snake, its main branch, enters the state at the S.E. corner. Apart from the lumber and probably the fishing industry, agriculture is by far the most important interest in the state. Gold and silver are obtained in small quantities, and coal in

considerable amount near Puget Sound. The university of Washington is situated at Seattle. Pop. (1910) 1,141,990. Olympia, the capital, is on Puget Sound. See Meany's *History of the State of Washington* (1909).

Washington, city and cap. of the United States, is situated on the l. bk. of the Potomac, at the head of tide and navigation. Most of the city has been built on the bottom lands, in an amphitheatre surrounded by bluffs, above which a part of the residential portion has spread. The city is coextensive with the District of Columbia, and covers 69½ sq. m. The street plan is regular and symmetrical, radiating from the Capitol. The streets and avenues are wide (90 to 160 ft.). The water supply is taken from the Potomac at Great Falls, 18 m. above the city. The total area of public parks is 3,600 ac. The city contains many libraries, the largest being the library of Congress, installed in a magnificent new building, which cost over £1,200,000; it contains upwards of 1,500,000 books and pamphlets. There is also a municipal or public library, housed in a beautiful white marble building given by Mr. Andrew Carnegie. Chief among the institutions for higher education is the Carnegie Institution (1902), which has an endowment of about £2,400,000. Other principal educational institutions are the George Washington (formerly Columbian) University, which had 1,387 students in 1910; Georgetown University (1,165 students); the Catholic University of America (300 post-graduate students); and Howard University (1,245 students), which is open to negroes. Washington is not a commercial or manufacturing city, but exists solely as the capital of the nation, and as an attractive residential city.

The Capitol occupies a commanding position near the centre of the city, and covers three and a half acres of ground. It is 751 ft. in length, and 324 ft. in greatest breadth, and, with its great dome, has a height of 285 ft. It cost £3,200,000. To the N.W. are the Treasury, the White House (the official residence of U.S. presidents), and the State, War, and Navy building, while between this group and the Capitol is the Interior Department. The Post Office Department occupies a handsome building on Pennsylvania Avenue, near the last mentioned; while S. of that thoroughfare are the Smithsonian Institution, with an astrophysical observatory, the Agricultural Department, and the tall shaft (555 ft.) of the Washington Monument. The Naval Observatory stands N.W. of the city in lat. 38° 53' 39" N. and long. 77° 3' 1" W. Pop. (1910) 331,069.

The District of Columbia is governed by three commissioners, appointed by the president of the United States, who also appoints the judges and other officers of the courts. See Tindall's *Establishment and Government of the District of Columbia* (1901); Cox's *Celebration of the One Hundredth Anniversary of Washington, 1800-1900* (1901); Benjamin's *Washington during War Times* (1902); and Wilson's *Washington the Capital City* (1902).

Washington. (1.) Parish and vil., Durham, England, 6 m. W. of Sunderland; has ironworks, collieries, and chemical works. Pop. 4,600. (2.) Bor., cap. of Washington co., Pennsylvania, U.S.A., 25 m. S.W. of Pittsburg, is the seat of the Washington and Jefferson Presbyterian college (1802). Iron and steel goods, tin plate, glass, carriages, and flour are manufactured. The district produces coal, natural gas, and cereals. Pop. (1910) 18,778. (3.) City, cap.

of Daviess co., Indiana, U.S.A., 96 m. s.w. of Indianapolis; has railway workshops. Coal and fireclay are mined. Pop. (1910) 7,854. (4.) Town, North Carolina, U.S.A., co. seat of Beaufort co., 31 m. N. of Newbern. It has fisheries, oyster-packing, boat-yards, sawmills, foundries, and manufactures of textiles, etc. Pop. (1910) 6,211.

Washington, BOOKER TALIAFERRO (c. 1858), American negro educator, son of a mulatto slave woman and a white man, was born near Hale's Ford, Franklin co., Virginia. In 1872 he worked his way to the Hampton Normal and Industrial Institute. Here he paid his expenses by acting as a janitor. In 1875 he returned to Walden, Virginia, where he had earlier worked in the salt furnaces and coal mines, and taught there for three years. He then attended the Wayland Seminary in Washington, and in 1879 was appointed an instructor at Hampton. In 1881 he accepted a call to organize and become the principal of a normal school at Tuskegee, Alabama. He opened the school on July 4, 1881, with an attendance of thirty students. In advancing the interests of the school Mr. Washington made a great many public addresses both in the North and in the South, and ultimately acquired the reputation of being one of the ablest public speakers in the country. In his educational work he has constantly emphasized the importance of the negro's accumulating property and making himself respected, and has discouraged his entry into politics. To further the attainment of the first end he lays unusual stress upon industrial education. He founded in 1892 the Tuskegee Conference, and in 1900 organized the National Negro Business League. The degree of A.M. was conferred upon him by Harvard

University in 1896, and that of LL.D. by Dartmouth in 1901. His publications include: *The Future of the American Negro* (1899), *Up from Slavery—An Autobiography* (new ed. 1910), *Character Building* (1902), and *My Larger Education* (1912). See Thrasher's *Tuskegee, Its Story and Its Work* (1900).

Washington, GEORGE (1732-99), first president of the United States of America, came of an old English stock, and was born at Bridges Creek, in Westmoreland co., Virginia. In 1753 Governor Dinwiddie selected Washington to act as commissioner to the French on the Upper Ohio. In 1754 he was appointed second in command of the Virginia forces sent against the French, and, after the death of Colonel Fry, found himself in chief command. He conducted a masterly retreat before the overwhelming French force which was sent to avenge Jumonville's defeat. In 1758 he was busy reorganizing the ill-drilled and badly-provided provincial militia. The necessity for intrenching himself on the Ohio frontier against superior French forces taught him lessons which were not forgotten when he came to make war against the British. At the close of 1758 he retired from active service. A wealthy marriage, and the inheritance from his half-brother of the Mount Vernon estate in Virginia, now made him a rich man.

Washington had expressed his strong dissatisfaction at the Stamp Act of 1765, and in 1773 supported the resolution for a committee of intercorrespondence between the colonies. He represented Fairfax county at the convention which met at Williamsburg in August 1774, and was appointed by the convention one of the six Virginian delegates to the first Congress. In 1775 Congress elected him commander-in-

chief of the colonial army, the colonies being then practically at war with the mother country. The only British general who might have matched Washington, Lord Cornwallis, was ill-supported by his colleagues, and was unable to act effectively. Washington's army of some 17,000 men was ill-found, ill-drilled, and honey-combed with discontent; but matters speedily righted themselves under his supervision. In 1776 the colonists drove the British out of Boston, and though they were compelled to fall back from New York, they rallied and retook what they had lost before the year was finished. Washington then remodelled his army, and enlisted men for a period sufficiently long to make soldiers of them. The campaign of 1777 commenced adversely to the Americans. They were defeated on the Brandywine and at Germantown, and lost Philadelphia. In 1778 Washington was better prepared for action, and a general attack compelled the British to retreat from Philadelphia. During 1779 he retained the positions he had won by the Hudson, and though a few of the coast towns were burned, he was able to protect New Jersey. In 1777 a treaty was made with France, by which the Americans were aided with both troops and supplies; but the combined forces made little headway against the naval superiority of the British until 1781, when the French and Americans completely invested Lord Cornwallis at Yorktown in Virginia, and compelled him to capitulate (October 19). This practically brought the war to an end; peace was proclaimed, and the British finally evacuated New York on Nov. 25, 1783. On the 23rd of December following, Washington resigned his commission to Congress. In 1789 he was elected president by the

unanimous vote of the nation. His journey to New York was a continual triumph. To enormous energy Washington added the cool brain of the man of business, an inflexible sense of justice, a personal disinterestedness of the rarest kind, and an indomitable will. His imposing figure and grave, masterful face became identified in the minds of the people with the nation. He was unanimously re-elected to the presidency in 1793. After the division of Congress into parties—Federalists and Democrats—took place, Washington strove to maintain what concord was possible between them. He also threw the whole weight of his influence into the preservation of America's neutrality in the contests which convulsed Europe. He was in favour of moderation. This almost lost him his popularity. When he appointed Jay as envoy to the court of Great Britain, the strong anti-British sentiment in America wrought suspicion and discontent. There were violent scenes in Congress, and a weaker man might have been overthrown. But Washington then, as always, made his will prevail against all objectors. Thoroughly wearied with office, Washington retired at the close of his term, and would not be persuaded to be renominated. He had no children, and none can claim direct descent from him. His writings have been issued by W. C. Ford (14 vols. 1888, etc.), and his *Life* written by Washington Irving (5 vols. 1855-9). See also H. C. Lodge, in *American Statesmen Series* (1889), and *Letters and Recollections of Washington* (1906); and *Lives* by Harrison (Heroes of the Nations Series), Ford (1897), Woodrow Wilson (1897), and Hapgood (1902).

Washington, MOUNT, in Coos co., New Hampshire, U.S.A., 75

m. N. by E. of Concord. It is the highest peak (6,293 ft.) of the White Mts. and of the north-eastern United States. On its summit, which is reached by carriage road and a rack and pinion railway, is a hotel.

Washington, TREATIES OF. (1.) That fixing the boundary of British America and the United States, June 12, 1846. (2.) The 'Reciprocity' Treaty, regulating the trade with Canada, June 7, 1854. (3.) The treaty referring the *Alabama* claims and the San Juan boundary question to arbitration; settling disputes with regard to fisheries; asserting that it is the duty of a neutral state, which desires to remain at peace with belligerents, and to enjoy the rights of neutrality, to abstain from affording any military aid to one or both of the belligerents, and to take care that no acts which would constitute such co-operation in the war be committed by any one within its territory—May 8, 1871. See *Political History of England*, vol. xii. (1907), and *Cambridge Modern History*, vii. (1903).

Washington Court House, tn., cap. of Fayette co., Ohio, U.S.A., 37 m. s.w. of Columbus. It has canneries, and manufactures chairs, stoves, soap, and fertilizers. Pop. (1910) 7,277.

Washita. See OUACHITA.

Wasmes, vil., Hainaut, Belgium, 6 m. w.n.w. of Mons. It has large coal mines and industrial establishments. Pop. 16,000.

Wasp, a name applied to two divisions of the Hymenoptera—the Diptoptera, or true wasps, and the Fossores, or fossorial solitary wasps. In both groups the body is less hairy than in bees, and the hairs are never plumose; the tarsus of the hind-leg is formed exclusively for walking, and is not modified as in bees. The true wasps are either

solitary or social. Of the solitary forms, mention may be made of the genus *Eumenes*, of which *E. coarctata* is British; and the genus *Odynerus*, of which fifteen species are British. These wasps construct small nests either in a burrow or attached to trees or walls, which are stocked by the mother wasp with animal food. The social wasps belong to the family Vespidae, the common genera being *Vespa*, which includes all the British species, and *Polistes*. In all cases the habits are very similar. In the spring a queen wasp emerges from the place where she has spent the winter, and proceeds to construct a nest. This at first consists of only a few incomplete cells, in each of which an egg is laid. These eggs soon hatch, and the time of the queen is occupied in feeding the young, at first with vegetable food, such as nectar or fruit pulp, and later with insects. The larvæ develop rapidly, and emerge from the cells as worker females. These workers relieve the mother of the task of feeding the larvæ, and the nest grows rapidly in size by the addition of new cells. As the wasps are very sensitive to cold, the nest is enveloped in a papery substance, apparently to maintain a high temperature. It is this sensitiveness to low temperatures which is the cause of the great variation in the number of wasps in different seasons, a very cold spring leading to a great reduction in the number of the wasps of summer. About August cells of larger size are constructed, and in these fertile males and females are produced. These leave the colony and mate; after the pairing the males die, while the females (or a proportion of them) seek shelter for the coming winter, each starting a new colony in spring. The original colony, after the production of the fertile



Wasps and their Nests.

1. *Eumenes coarctata* and nest. 2. *E. zanthura* and nest. 3. *Odynerus spinipes* and group of nests on bank. 4. *Vespa crabro* and nest in tree. 5. *V. germanica* and nest in ground, partly uncovered to show combs. 6. *V. norvegica* and nest in tree, showing combs. 7. *Spheg argentata*. 8. *Pepsis elevata*. 9. *Icaria* and nest on branch. 10. *Apocis pallida* and nest on tree. 11. *Pelopeus chalybeus* and nest. 12. *P. lactus* and nests.

forms, rapidly dies off, the remaining larvæ being first destroyed by the workers. Even in the tropics the colonies die off in the same way. The nest is never used for more than one season. In India *Vespa velutina* is stated to construct a nest which reaches a length of several feet. Of the British forms, *V. crabro*, the hornet, frequently places its nest in a hollow tree; the common wasp (*V. vulgaris*) nests underground; while the wood-wasp (*V. arborea*) and its allies suspend theirs from the branch of a tree or shrub.

The sting of wasps, and especially of the hornet, is severe, but the insects do not sting unless provoked. If the nest be interfered with, however, they display great fury, and will follow the attacker for a long distance. Though wasps cause a considerable amount of destruction to fruit, they also destroy a large number of insects.

The fossorial solitary wasps have not the fold in the anterior wings possessed by the true wasps. Their habits are very diverse, though *Sphex* is a type of a very large family. Another interesting family is that of the Pompilidæ, whose members chiefly prey upon spiders, especially the poisonous forms. To these families belong the sand wasps, which dig their burrows in sand and stock their nests with insects. In S. America occurs the genus *Pepsis*, whose members may reach a length of over two inches, and have a very powerful sting; they attack and overcome the large bird-catching spider (*Mygale*). See Lubbock's *Ants, Bees, and Wasps*; *Camb. Nat. Hist.*, 'Insects,' vol. ii.; Peckham's *Instincts, etc., of Solitary Wasps* (1898); De Saussure's *Monographie des Guêpes sociales* (1853-8); and G. W. and E. G. Peckham's *Wasps, Social and Solitary* (1905).

Wasp, a British steam gun-boat, which was lost in September 1887 while on a passage from Singapore to Hong-kong, all on board—seventy-three officers and men—perishing.

Wasquehal, comm., France, in Nord dep., 3 m. N.E. of Lille. Pop. 6,700.

Wassail, a spiced beverage prepared from roasted apples, sugar, toast, nutmeg, other spices, and old ale. During the Anglo-Saxon and early English period wassail played an important part on all great festive occasions.

Waste. A tenant-for-life may not commit waste—that is to say, speaking generally, he may not do any act which will diminish the capital value of the estate. Waste is voluntary or permissive. Voluntary waste consists in doing active acts of waste—e.g. pulling down the manor house, opening mines, or ploughing up meadow land. Permissive waste consists in allowing buildings to get out of repair. A tenant-for-life is not liable for permissive waste, unless the terms of the grant expressly provide that he shall be; the estate may also be given to him 'without impeachment of waste,' in which case he may commit voluntary waste; but even then he is not allowed to commit equitable waste, which consists in spiteful or wilful acts damaging the estates—e.g. cutting down ornamental timber, or despoiling a family mansion. The remedy for waste is an action for damages, or for an injunction to restrain the acts.

Watch, the period of time that each portion of a ship's crew is on duty. The seven watches of the log-book are:—From 8 p.m. to 12 midnight, first watch; 12 to 4 a.m., middle watch; 4 to 8 a.m., morning watch; 8 to 12 noon, forenoon watch; 12 to 4 p.m., afternoon watch; 4 to 6 p.m., first dog watch; 6 to 8 p.m.,

second dog watch. The turns for duty are made uneven in number by means of the dog watches, in order that each man may have a different time for duty on successive days. The master's watch is called the starboard, and the mate's the port watch. In a British man-of-war, where the crew is commonly divided into three watches, a lieutenant is officer of the watch, and has charge of the ship, subject to the captain's directions, during the time. The watches and hours at sea are marked by bells, one tap for every half-hour, and a pair for each hour of the watch, eight bells marking the end of each watch.

Watch. See HOROLOGY.

Watchet, urb. dist. and seapt. tn., Somerset, England, on the Bristol Channel, 16 m. N.W. of Taunton. Ironfounding and paper-making are carried on. Pop. (1911) 1,846.

Water, H_2O , a compound of one volume of oxygen gas with two of hydrogen, the proportions by weight being 8 of the former to 1 of the latter. It occurs in vast quantities in nature in the solid, liquid, and gaseous states, covering no less than 72 per cent. of the surface of the globe. It constitutes about seven-eighths of the animal body and nine-tenths of many plants, whilst it is also present in many minerals. Water is formed in many chemical actions—for example, by the combustion of hydrogen and its compounds; but when required practically, it is either used in its natural state or after purification by distillation. At ordinary temperatures water is an odourless, faintly greenish-blue liquid. It boils at $100^{\circ}C$. under normal pressure, and freezes with expansion at $0^{\circ}C$., the former change requiring an expenditure of 536 calories per gram, and the latter the removal of 80 calories. Water

is most dense at $4^{\circ}C$., expanding with rise and fall of temperature, 1 c.c. at this point weighing 1 gram. It is very incompressible, a bad conductor of heat and electricity, and is taken as a standard of comparison in determination of specific heat and specific gravity, and in settling the unit of temperature. Water has great solvent power, apparently merely mixing with the substance in some cases, dissociating it into ions in others, or forming hydrates with it in still other cases. Chemically, water is neutral, but enters easily into many chemical actions: thus it forms acids with anhydrides, has its hydrogen displaced by sodium and other metals, and enters into combination with many salts to form compounds containing water of crystallization. It also seems to play an important part in chemical action: many substances that react vigorously in presence of water refuse to do so in its entire absence.

Natural Waters.—Rain water, if collected on a clean and insoluble surface in the country, is, except for a little dust and some air gases, practically pure; the same is almost equally true if it falls on rocks like granite or slate and the soils derived from them. A considerable difference is, however, observed if the rock or soil contains organic matter, common salt, calcium sulphate, calcium or magnesium carbonates, or other soluble components. It is true that the carbonates of calcium and magnesium are not soluble in pure water, but rain water which has dissolved carbon dioxide from the air and surface soil can freely dissolve them, calcium and magnesium bicarbonates being formed. These bicarbonates, as well as calcium sulphate or chloride, render the water 'hard'—i.e. hinder it from lathering with soap. (See WATER-

SOFTENING.) Besides carbon dioxide, natural waters contain dissolved air, which improves the taste, oxidizes organic impurities, and supplies the oxygen for the respiration of fish. Table I. shows the number of grains per gallon of solid impurities in typical natural waters.

Water for Domestic Use.—For drinking, water should not be too soft, and must not contain much

The diseases carried by water are due to specific micro-organisms, which live and flourish in impure water. The mere presence of sewage matter would not render the water dangerous for drinking purposes. It is what accompanies or might accompany the sewage that is the dangerous element, and this can only be definitely settled by bacteriological examination.

Table I.

	River Trent.	River Dee.	Loch Katrine.
Calcium carbonate	32	85	35
Calcium sulphate	21.55	12	64
Magnesium carbonate	5.66	36	
Sodium chloride	17.63	72	79
Silica	72	14	10
Iron and alumina	50	06	
Organic matter	3.68	1.64	80
	50.06	3.89	2.68

Table II.

	Good Water.	Bad Water.
Total solid residue	12.35	38.65
Volatile residue	2.07	6.83
Free and saline ammonia . . .	0.0014	0.025
Albuminoid ammonia	0.005	0.015
Chlorine	1.66	5.98
Nitrogen as nitrates	0.00	0.89

magnesium compounds, or be able to dissolve lead. Table II. shows typical analyses of a good and a bad water, the figures being given in grains per gallon. The organic matter, which is represented by the ammonia, albuminoid ammonia, chlorine, and nitrates, includes all those substances which a water may derive from animal or plant products.

One of the commonest methods of purifying water is to filter it. One of the best materials for filtering water on a large scale is fine sand, but it must be frequently renewed if the filtration is to be efficient. Professor P. Frankland has shown that the system of sand filtration adopted by the London water companies, drawing their supply from the

polluted Thames, is capable of reducing the number of micro-organisms present in the original water on an average 97·7 per cent. The amount of reduction is proportional to the thickness of the sand layer and the slowness of filtration. But the ordinary domestic filter is more often a source of danger than the reverse, the filtering material becoming clogged with impurities.

Even on the large scale filtration may be ineffectual in rendering a dangerously polluted water safe for drinking purposes, though treatment with ozone appears from recent experience to be a safe but expensive method of preventing the propagation of disease.

On the small scale there is every reason to believe that a few minutes' boiling will destroy all organized organic matter in a water except the spores of a few bacteria, which in all probability are not disease-producing. Boiled or distilled water, however, has no air in it, and is in consequence flat and insipid, and some system of aeration should be adopted to overcome this. Some waters, if passed through lead pipes or stored in leaden cisterns, take up a sufficient quantity of the metal to cause poisoning. The exact conditions which favour the solution of lead in water are not as yet fully understood, but soft waters and those containing much organic matter along with nitrates are more liable to lead contamination than hard waters.

Water for Technical Purposes.—For steam-raising purposes a hard water is unsuitable, as the earthy carbonates and sulphates are precipitated in the boiler, and form what is technically known as 'scale.' Magnesium chloride is also objectionable, because it has a corroding action on the boiler plates. Hard water is also objec-

tionable to the textile worker, as it precipitates and wastes the soap required in the scouring processes. The brewer, on the other hand, seeks for a hard water; and if he cannot obtain it in the neighbourhood of his brewery, he has to 'burtonize' it, or add hardening material. Carbonate of calcium is suitable for brewing all kinds of beers; whilst calcium sulphate, characteristic of the Burton waters, is necessary for the production of pale ales and light bitter beers. Magnesium salts are objectionable in brewing water unless in the form of carbonate, which is in great measure precipitated in the heating of the water before it is run into the mash tun. Alkaline carbonates are very objectionable, as they not only extract and keep in solution the albuminoid matters of the grain, but they also dissolve a harsh flavouring matter from the hops. In the brewing of stout and porter a softer water is desirable—a type of water also preferred by the maltster, as hard water extracts more of the organic matter from the grain. Too much salt in water used for malting retards germination of the grain, ten grains per gallon of this ingredient being the maximum allowable. See Frankland's *Micro-Organisms in Water* (1894), Leffmann's *Examination of Water* (1899), Rideal's *Water and its Purification* (1902), and Thresh's *Examination of Waters* (1904).

Water-bath. In this apparatus a substance that is required to be heated to a temperature not exceeding that of boiling water is placed in a suitable vessel, supported by rings, in an outer vessel containing water, and heated over a fire or burner. The common glue-pot is an example.

Water-bed, an appliance designed to distribute the weight

of a patient's body over as large a supporting surface as possible. It consists of a large rubber bag partially filled with warm water. It should be soft and lax enough to allow of its ballooning up on each side of the patient. Some water-beds are made in sections, but the filling of these demands special care. The heat from a patient's body is sufficient to keep a water-bed warm.

Water-beetles. See DYTISCUS.

Water-boatman. See BOAT-FLY.

Waterbrash. See PYROSIS.

Water-bugs (*Hydrocorisæ* or *Cryptocerata*), a division of hemipterous insects, characterized both by their aquatic habitat and by the fact that the antennæ are concealed on the under surface of the head, and so appear to be absent. There are a considerable number of water-bugs, all of which have the front legs rather short, and use them to seize their prey. Examples are the water-scorpion (*Nepa cinerea*)—an insect with a leaflike body and two long processes at the end of the tail, which is found in stagnant water—and the boat-fly.

Waterbury, city, New Haven co., Connecticut, U.S.A., on Naugatuck R., 18 m. N.N.W. of New Haven; manufactures watches, brass goods, rolling-mill and foundry products, photographic materials, electrical appliances, and chemicals. Pop. (1910) 73,141.

Water-caltrop. See TRAPA.

Water-channels may be classed under two heads: (1) those in which the water has its surface open to the atmosphere; (2) those in which the water has no free surface—i.e. is flowing under pressure. The carrying capacity of a channel depends upon (1) the cross-section area of the stream; (2) the wetted perimeter of the channel; (3) the

gradient of the stream, or, in pressure pipes, the hydraulic gradient or slope; (4) the smoothness of the channel. The ratio

$\frac{\text{cross-sectional area}}{\text{wetted perimeter}}$ is called the hydraulic radius or hydraulic mean depth, and is represented by r . In the case of circular channels flowing full or half full $H.M.D. = r = \frac{1}{2}$ diameter. Gradient of the stream or hydraulic

slope s is $\frac{h}{l}$, where h = the differ-

ence of level of the free surface between two points at distance l , or, in the case of pressure conduits, is the amount of pressure head which is lost along a length of pipe l . The Chézy formula gives the mean velocity as $V = c\sqrt{rs}$, where c is a coefficient depending on the smoothness of the surface, and varies between 93 and 103 (the units being feet and seconds).

1. *Channels open to the Atmosphere.*—If the ground-level is suitable, a ditch will serve, the natural earth banks being left. But hard clay or gravel is able to stand a velocity of only from three to four feet per second, and light sandy soil only from a half to two feet per second. At the same time, unless the velocity is from two to three feet per second, it is not sufficient to prevent weeds from growing and silt from being deposited. Such a channel with natural banks is the New R., cut in 1609-13 by Hugh Myddelton to supply London with water from the Chadwell springs in Hertfordshire. It has a fall of five inches per mile.

When rock is cut through, the channel is frequently left rough for economy. But a lined channel will have a greater carrying capacity than an unlined one, owing (1) to the decrease in friction, and (2) to its being possible to secure a greater velocity. Wood lining is used in

America for irrigation flumes; brickwork or concrete is generally used in Britain. If the water is for drinking purposes, the channel is frequently covered. This keeps out pollution, and by excluding sunlight prevents weeds from growing. Where the ground-level rises above the gradient line of the channel, either a deep cutting has to be made or a tunnel has to be driven. Where the ground-level sinks below the gradient line of the channel, a bridge (popularly called an aqueduct) is generally built. The bridge can be avoided by carrying the water across the low-lying ground through an inverted siphon under pressure. This is seldom done except in pipes; but still there are cases of masonry aqueducts and tunnels being so subjected to pressure.

Channels flowing open to the atmosphere must be provided at intervals with overflows, sluices, and emptying valves and channels, so that the aqueduct can be emptied and cleaned out in sections. Where an inverted siphon commences and ends chambers are built which contain valves, arranged in some cases to close automatically if the pipe in the valley bursts, and thus prevent a great loss of water. At the lower end of the siphon there are back-flap valves, which prevent the water from flowing the reverse way. At the upper end they are arranged to close when the flow increases beyond a certain velocity.

2. *Conduits under Pressure.*—Only occasionally is pressure put on masonry conduits or tunnels, or on pipes of cement or earthenware. They can, however, be constructed to stand a small head, though in almost all such cases metal pipes are used. Recently large mains have been laid in America of wooden staves clamped

with iron bands. Wrought-iron tubes and steel pipes formed of riveted or welded plates have of late years been greatly used, on account of their being lighter than cast-iron pipes of the same diameter. A pipe line requires the strongest pipes in the valleys—i.e. where it dips most deeply below the hydraulic gradient; where it approaches the hydraulic gradient at the crests the pressure is least, and the lightest section of pipes is there used.

No part of the pipes ought to rise above the hydraulic gradient. At all summits air-valves are fixed on the top of the pipe to allow the accumulated air to escape. If not so let off, it would be very liable to form an air-lock, and thus stop the flow. At the lowest point on the pipe in every depression a branch pipe is put on, with a valve for emptying and scouring the main. At intervals sluice valves should be fixed so as to divide the line into sections. Fig. 1 shows the section of a pipe

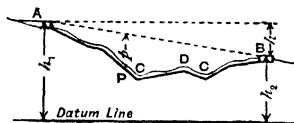


FIG. 1.

line of length l from a storage reservoir A at level h_1 above datum to a service reservoir B at level h_2 ($h_1 - h_2 = h$). The hydraulic gradient is $\frac{h}{l}$. If this sec-

tion is plotted so that the horizontal distances between points on paper are equal to the lengths of pipe between these points on the ground, and if the pipe is of one diameter from A to B, the hydraulic gradient is represented by a straight line from A to B. The pressure (in feet of water

head) at any point in the pipe is represented by the vertical distance from that point to the line AB—e.g. the pressure at $P = p$ measured in the scale to which the section is plotted; C, C are positions for scour valves; D is the position for an air-valve.

Cast-iron pipes are generally made in 9 ft. or 12 ft. lengths, steel pipes in greater lengths. The following kinds of joints are

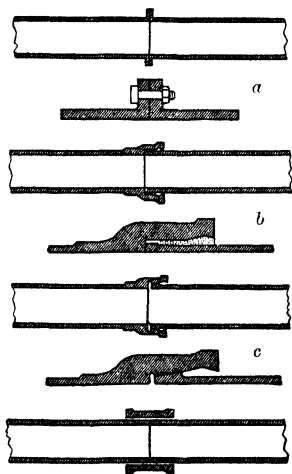


FIG. 2.

used with cast-iron pipes (Fig. 2):—
(a) Flanged, joined by placing a washer of rubber or lead between the flanges, and tightening them together with bolts and nuts.
(b) Spigot and socket (or bell, America). The spigot fits into the socket, and is held in its position concentric with the other pipe by means of a coil of rope-yarn packed tightly round it, or a ring of lead wire; and then the rest of the socket is filled with molten

lead, which is finally calked tightly in with a heavy hammer and special tools. Lately yarn has been greatly superseded by lead



FIG. 3.

wire, or by having solid-run lead joints in all except small diameter pipes, since the yarn must, of course, rot in time. (c) Turned and bored. A bevelled ring on the spigot is turned to fit exactly into a correspondingly bored portion of the socket, and the one pipe is driven tightly into the other, after painting the turned and bored surfaces with sal ammoniac, which causes them to rust together. Sometimes the socket is slightly expanded by heating, so as to receive the spigot more easily, and grip it more tightly on cooling. The rusting of the joint, instead of being produced by sal ammoniac, may be caused by smearing the touching surfaces with a mixture of tallow and resin. (d) Large cast-iron pipes are sometimes made with a spigot at each end and joined by a collar (of cast iron or steel), which is leaded over the two abutting spigots. In place of lead with which to fill the socket in cast-iron pipes, wooden wedges have been used with success in America. Riveted steel pipes have longitudinal joints as well as circular. The longitudinal joints may be (1) welded; (2) riveted (Fig. 3), either



FIG. 4.

with lap joint or butt joint; (3) lock-bar or 'Coolgardie' joint (Fig. 4). The edges of the plates are 'upset,' inserted in the grooves

of the locking bar, which is closed down on them with hydraulic pressure. The circular joints are (1) riveted—only for large pipes; (2) spigot and socket, the socket being riveted on, or the pipe metal being expanded to form it; (3) double spigot and steel collar or Kimberley collar. Wrought-iron and steel tubes are made with screwed spigots to fit into a screwed collar or sleeve, and sometimes with an expanded socket, which is screwed. See Folwell's *Water-supply Engineering* (ed. 1903), and Burton's *Water Supply of Towns* (ed. 1898).

Water-chestnut, JESUIT'S NUT, or WATER-CALTROPS. See TRAPA. The name water-chestnut is also sometimes given to the edible tubers of the Chinese plant *Scirpus tuberosus*.

Water-clock. See CLEPSYDRA.

Water-colour Painting. All paints or pigments must be thinned with some medium, such as oil or water; and when the bulk of the medium is water, we get the class of colours known as water colours. Water-colour painting includes also painting in 'tempera,' undoubtedly the most ancient mode of painting. Tempera is so called because the colour is to a large extent tempered with a glutinous binding medium, soluble in water, such as size, gums, or egg. The binding medium of ordinary water colours is a very small proportion of gum or some such substance. In their preparation there is also added a little glycerin, to keep them in such a moist condition that they may be easily soluble in water. The preparations for tempera are fully described in such works as Field's *Grammar of Colouring* (1875), or F. Hamilton Jackson's *Mural Painting* (1904).

The term 'transparent' applied to colour means that such colour will not altogether hide the col-

our of the surface to which it is applied. Generally, transparent colours give the appearance of richness and depth. Opaque means that the pigment has body or more substance in it, so that it will cover or hide the surface underneath. The right use of water colours, and very much of the beauty of all water-colour work, depend largely on the right understanding of these two qualities. Generally water-colour drawings are done on white paper. 'The true character of water-colour painting is that the lights should be obtained by leaving the white paper more or less exposed' (Field).

The paper for water-colour painting should not be glazed or very smooth, but should have a certain amount of grain or 'tooth' on it. The number of colours used should be as few as possible. The work should be done as direct as possible. A wash always appears lighter when dry than when wet. All pigments may have body added to them by the addition of white, Chinese white being probably the best to use; but the addition of white quite changes the colour of the pigments. House painters use water colour mostly for colouring large flat surfaces, such as walls and ceilings; but they add a binding medium, such as a thin solution of size or glue, so that the colour may not be easily rubbed off. The trade name of such a mixture is 'size colour' or distemper. A surface painted with ordinary distemper must not be washed; but there are several patent mixtures on the market which can be washed, such as duresco and Hall's distemper. See Roget's *History of the Old Water-colour Society* (1891), Holme's *English Water Colour* (1902), Redgrave's *History of Water-colour Painting in England* (1892), MacWhirter's *Landscape*

painting in Water Colour (1900), Wyllie's *Marine Painting in Water Colour* (1901), and Finberg's *The English Water-colour Painters* (1906). See also PAINTING.

Water-cress. See CRESS.

Water-cure. See HYDROTHERAPY.

Water-deer, a name applied to various even-toed ungulates. The Chinese water-deer (*Hydropotes inermis*) is a small form, which resembles the musk-deer in having no antlers in both sexes, and in that the males have elongated tusks in the upper jaw. In other respects it differs from the musk-deer and resembles the true deer. It is, however, a primitive type of deer, shown by the fact that from two to six fawns are produced at a birth. The name water-deer is sometimes also given to the waterchevrotains, and to the waterbuck of S. Africa (*Cobus ellipsiprymnus*).

Water-dropwort, the popular name given to plants belonging to the genus *Oenanthe*, of the order Umbelliferae. They bear few-rayed flowers in compound umbels, followed by globular umbels of egg-shaped fruits, neither flattened nor beaked. (*O. fistulosa* is the tubular water-dropwort).

Waterfalls are naturally commonest in a mountainous country. Yet some of the finest, such as Niagara and the Victoria Falls of the Zambezi, are found in relatively flat lands. In the former case the configuration is usually such that long, deep valleys have tributaries whose beds have not been cut down to the level of the mainstream, and enter over waterfalls—at least in glaciated areas. Such waterfalls are common all over the Highlands of Britain and Scandinavia, in the Alps of New Zealand, and other mountainous areas—e.g. Foyers, Scotland (205 ft. in two leaps); the Staubbach in

the Alps (870 ft.), Sutherland Falls in New Zealand (1,900 ft.), Yosemite Falls in the Sierra Nevada of California (2,660 ft.). In flatter areas the waterfall is usually due to the existence of rocks of different powers of resistance to erosion, lying horizontally or dipping up stream. The Niagara Falls (170 ft.) are due to a resistant layer of compact Niagara limestone covering more easily eroded soft shales. Frequently the upper bed is a lava with vertical joints, as in the Victoria (Zambezi) Falls (400 ft.). A volcanic dyke may form a barrier across a stream sufficient to give rise to a waterfall. Another type of waterfall occurs in limestone districts, where the water may disappear underground in a channel dissolved by the stream—e.g. falls of the Rhone at Bellegarde. One of the most remarkable of waterfalls is that of the Kerka in Dalmatia, where the river, by depositing layer after layer of travertine, has so built up its bed that a waterfall has been formed. In a tidal river waterfalls may be found across a barrier, as is the case in the falls of the St. John R. in New Brunswick, where the water falls towards the sea twice a day at low tide.

Waterfalls are used to supply energy either for directly moving machinery by turning a mill-wheel or a turbine, or indirectly through the electricity generated in dynamos worked by turbines. The Niagara Falls exhibit a most important industrial utilization of water power; but the Sault Ste. Marie, between Lakes Superior and Huron, the Falls of St. Anthony on the Mississippi, the Falls of Foyers in Scotland, the Rhine falls, and the Rhone falls of Bellegarde, and the innumerable waterfalls of Scandinavia, Switzerland, and similar mountainous lands, are all utilized in this way. It was proposed (1906)

to convey power generated at the Victoria Falls of the Zambezi to the Rand gold-field of the Transvaal, but the proposal has not yet (1912) been carried further.

Water Finding. See DIVINING ROD.

Water-flea, a general name given to minute free-swimming Crustacea, whether fresh water or marine, especially to the members of the Ostracoda, Cladocera, and Copepoda. Among the Ostracoda common examples are the fresh-water *Cypris* and the marine and fresh-water *Cythere*. The species of *Cypris* are abundant in ponds, while the marine species of *Cythere* occur in rock pools. In both genera there are a bivalved shell, seven pairs of appendages, and a rudimentary abdomen. Of the Cladocera a very common example is *Daphnia pulex*, abundant in fresh water, where it swims by means of its large antennæ. It has a bivalved shell and a dorsal brood-chamber. Abundant in fresh water is also the copepod *Cyclops*, in which the female has two conspicuous external egg-sacs.

Waterford. (1.) Maritime co., prov. Munster, Ireland. The coast is broken by several inlets—Waterford Harbour, Tramore Bay, Dungarvan Harbour, Ardmore Bay. Mountainous in N. and N.W.; Comeragh Mts. (2,597 ft.), Knockmealdown Mts. (2,605 ft.), on Tipperary border, and Drum Hills (990 ft.) in S.W. Principal rivers: Suir, falling into Wexford Harbour; and Blackwater, into Youghal Harbour. The Grand Canal affords through navigation between Waterford and Dublin. More than half the surface is under pasture; dairy-farming is important. Marble is quarried near Cappoquin and Whitechurch. Copper, iron, and lead also occur. The county returns two members to Parliament.

Area, 717 sq. m. Pop. (1911) 83,766. (2.) Munic., parl., and co. bor. and city, cap. of Co. Waterford, Ireland, on the Suir, 94 m. S.W. of Dublin; has Protestant and Roman Catholic cathedrals. Fragments of the city walls remain, including an 11th-century tower. The harbour is formed chiefly by the estuary of the Suir and Barrow. There are breweries, flour mills, foundries, and important fisheries. Butter and bacon are the principal exports. Pop. (1911) 27,430.

Waterford, LOUISA, MAR-CHIONESS OF (1818-91), English artist, was the daughter of Lord Stuart de Rothesay. She painted a number of exquisite pictures—as *Spring*, *Christmas*, and *The Miracle of Healing the Two Blind Men*; while she illustrated several volumes of the poets. See Augustus Hare's *Two Noble Lives* (1893).

Water-gas. See GAS MANUFACTURE.

Water-gauge, an instrument for indicating the height of water. One of the commonest forms is that attached to the front of boilers, which consists of a glass tube fixed perpendicularly to the boiler, and having a communication at the upper end with the steam space of the boiler, and one at the lower end with the water in the boiler. See BOILER.

Water-glass. See SOLUBLE GLASS.

Watergraafsmeer, a S.E. suburb of Amsterdam, Netherlands. Pop. (1910) 7,814.

Water-hemlock (*Oenanthe crocata*), a common British water-side plant, growing to a height of two or three feet, with clustered tuberous roots, glossy thrice-pinnate leaves, and wedge-shaped leaflets. It belongs to the order Umbelliferae, and bears white flowers in late summer. The whole plant is poisonous.

Water-hen. See RAIL.

Water-hog, a name given to the bush-pigs or river-hogs of Africa, sometimes referred to a separate genus as *Potamochoerus*.

Waterhouse, ALFRED (1830-1905), English architect, born at Liverpool; in 1859 designed the Assize Courts, Manchester, and from that time onwards rose steadily, until, on his retirement in 1902, he held a leading position in British architecture. In the partial rebuilding of Caius College, Cambridge (1868), he modified the Gothic style of his work, which appeared more distinctly in the New University Club (1866). Among his varied undertakings were also Girton College, Cambridge; Eaton Hall; the National Liberal Club; the Natural History Museum, S. Kensington; the Liverpool Infirmary, and other hospitals; and the Hotel Metropole, Brighton. He became an Academician in 1885.

Watering Plants. Water is useless unless given in sufficient quantities to reach the roots. Sprinkling the ground merely cakes the surface, and does harm to the plants. All plants should be watered only when necessary—when they are dry. This is indicated by a tendency to flag or wilt, or by the hollow sound of the pots when tapped. The latter is the safest sign, as, after a prolonged period of dull weather, many plants wilt on exposure to bright sunshine, although still wet at the roots. But a growing plant should not be allowed to become so dry as to wilt, nor should the soil ever reach a condition as dry as powder, except in the case of bulbous and tuberous kinds, during their resting period. Plants under glass should not be sprayed overhead while the sun is shining hot and full upon them. Evening is the best time of the day for watering in summer, and morning in winter. In watering with liquid manure,

the material should not come in contact with the foliage. Plants recently potted should not be watered heavily at the roots for a week or ten days; spray them frequently overhead.

Water-lily, a term applied to various water plants, especially to certain species of the genera *Nymphæa* and *Nuphar*. The beautiful white water-lily of British lakes and rivers is *Nymphæa alba*; the common yellow water-lily is *Nuphar lutea*.

Waterloo, vil., Belgium, 11 m. S. of Brussels. On the morning of June 18, 1815, Napoleon had assembled an army of about 74,000 men in front of the ridge of Mont St. Jean and the forest of Soignies. Wellington confronted his adversary with an army of about 67,000 strong, but composed of various nationalities. The attack began by a demonstration against the British right, but was converted into a real attack. The advanced post of Hougomont was fiercely assailed, but the defence was admirably sustained. Soon after mid-day Napoleon received the intelligence that Bülow, with the 4th corps of the Prussian army, was at St. Lambert, menacing his right flank. A body of French infantry and cavalry was told off to hold Bülow in check, and orders were sent to the French general Grouchy, who was a few miles away, to fall on Bülow and to march to Waterloo. At about half-past one the French began the first grand attack. The 1st corps of D'Erlon advanced against Wellington's centre and left centre. But a magnificent charge of British cavalry drove D'Erlon back down the slope. Meanwhile another grand charge of British cavalry had defeated a body of cuirassiers sent to support D'Erlon, and the French attempt to pierce Wellington's centre at La Haye

Sainte was defeated with heavy loss.

It was now about three in the afternoon, and Napoleon had received news that Grouchy would be unable to arrive in time. He resolved to make head against Bülow. Meanwhile he ordered Ney to storm and occupy La Haye Sainte, and to intrench himself firmly within that point of vantage, until, Bülow having been repulsed, the reserve of the Imperial Guard and the masses of the French cavalry could be launched in another mighty effort against the allied position. Under cover of a tremendous cannonade the French captured La Haye Sainte at about six in the evening. This gave them access to Wellington's centre. Ney, thinking that Wellington was about to retreat, resolved to make a cavalry attack against the British right centre. But the French horsemen recoiled before the British and German squares. Napoleon severely blamed Ney for his action, but allowed him to engage all the French cavalry reserves, fully 10,000 strong. They charged again and again, but failed to pierce the invincible squares. Meanwhile Blücher, who had arrived at St. Lambert, ordered Bülow to attack. The Prussian onslaught began at about half-past four by an attack on Planche-noit on the French right and rear, threatening their only line of retreat. Napoleon was compelled to detach the Young Guard and part of the Old Guard, together about 6,000 strong, to keep back the advancing Prussians, and at about six Bülow's attack was repelled.

As the battle was still undecided, Napoleon resolved to strike a last blow for victory. Wellington had used up nearly all his cavalry, and gradually pushed forward into the fighting

line his infantry reserves. At a little after seven the French onset began along the whole line. On the right the troops of D'Erlon gained some partial success; the pressure on Wellington's centre at La Haye Sainte became intense. But on the left the defenders easily held their ground. Then six battalions of the Guard, rather more than 3,000 strong, advanced against Wellington's strengthened right centre. They reached the crest of the ridge in four columns; but these were defeated, one after the other, by the fire of the deployed British infantry, who, rising from their concealed position, drove the stricken masses into the valley below. At the same moment the British commander pushed his whole army forward. Soon after eight o'clock part of the Prussian 1st corps made its appearance on the field, and Napoleon's right was instantly driven in, and the French army began to dissolve in rout. A short time afterwards Bülow renewed the attack on Napoleon's right flank and rear; Planche-noit was stormed after a desperate struggle, and 40,000 more enemies bore down on the French host. The defeated army fled in disorder from the field, save the four battalions of the Guard, who, formed into squares, fought stubbornly to the last, and perished almost to a man. The French army was virtually annihilated; the losses of Wellington and Blücher were about 20,000 men. See Lt.-col. S. C. Pratt's *The Waterloo Campaign* (1907); Houssaye's *1815* (new ed. 1905); Ropes's *Campaign of Waterloo* (new ed. 1906); and Siborne's *Waterloo Campaign* (1894).

Waterloo. (I.) City, Iowa, U.S.A., co. seat of Blackhawk co., on Cedar R., 95 m. N.E. of Des Moines. There is abundant water-power for manufactures of agricultural implements, auto-

mobiles, gas engines, and steel ranges. There are also railway shops, and canning and packing establishments. Pop. (1910) 26,693. (2.) Suburban tn., New South Wales, 2 m. s. of Sydney; with glass works, breweries, soap works, and paper mills. Pop. 10,000.

Waterloo Cup. See COURSING.

Waterloo - with - Seaforth, urban dist., S. W. Lancashire, England, 4 m. N. of Liverpool. It is frequented for sea-bathing. Pop. (1911) 26,399.

Water-mark. See PAPER.

Water-meadows. Irrigated meadows in Great Britain are principally confined to Hampshire, Wiltshire, Gloucestershire, Dorset, Devonshire, and Berks. Water is taken off at a higher level, allowed to spread by means of open ditches and controlling hatches (sluices), and the tail water conveyed off the land back to the river. The tail water from an upper set of meadows becomes the head water of the next and lower meadows, and in this way the water passes down the valley. At the same time water is taken off and returned to the river at any convenient spot. The privilege of using the water is common, and is regulated by usage. The water is applied in alternate weeks from November to March. The meadows are then kept dry for the early spring feed, which is eaten by ewes and lambs. After the spring feed has been eaten, water is again applied every alternate week until the meadows are laid dry for hay-making, about the latter end of June. When the hay has been secured, the meadow is again watered in order to produce an autumn feed, which is useful for horses and cattle. The meadows are cleared of stock in November. The letting value of a good meadow for the entire season is often £8 per acre.

Water Measurements. The English practical unit of quantity for water is the gallon. The volume of a cistern, tank, or reservoir is calculated geometrically from the linear dimensions, and the result, in cubic feet, is multiplied by 6'2355, or approximately 6½, to convert it into gallons. The United States gallon = '83 imperial gallon. American engineers make use of the unit 'acre-foot' in describing a reservoir's capacity and in connection with irrigation water, 1 acre-foot being 43,560 cubic feet, or 271,618 gallons. Water is measured frequently by its rate of flow, which includes volume and time, as cubic feet per second or gallons per day. The formula for the velocity of water discharging through an orifice, when the water is open to atmospheric pressure and the flow is due to the action of gravity, includes g , in which the units are feet and seconds— $v = c\sqrt{2gh}$; v = velocity in feet per second; g = acceleration due to gravity = 32'2 ft. seconds per second; h = head of water in feet pressing upon the orifice; c = a coefficient depending upon the form, etc., of orifice. For convenience, however, formulæ generally include a constant, so that the result appears as cubic feet per minute, gallons per minute, gallons per hour, or gallons per day. It is useful to note that gallons per day of twenty-four hours $\div$ 9000 = cubic feet per minute approximately. The carrying capacity of a pipe, the flow of a stream, and the discharge over a weir are frequently given in cubic feet per minute or second. Quantities to be supplied per head of population, rate of filtration, amount of compensation water, are generally given in gallons per day.

Of Water in Open Channels.—

(1.) Small streams can be measured by forming a clay dam across

the channel, and allowing the water to rise till it flows through a pipe or spout, beneath which the pail or measuring box is placed; the flow in cubic feet per minute can be calculated from the time taken to fill the measure. In this, as in other methods, the average of several tests should always be taken. The measuring cistern found on pipe lines is a small masonry tank, with vertical sides and of known floor area, and through it all the water passes. When it is desired to measure the flow, the discharge is stopped for a few minutes, and the rate at which the cistern fills up is noted. In a more elaborate manner this method is frequently used in measuring the flow into service reservoirs. The pipe conveying the water to be measured discharges into a measuring box with a rapidly closing valve at the bottom. When the valve is open the water drops directly through it, leaving the box empty. To measure the flow the valve is shut, and the exact time of shutting is noted. As soon as the box is full and commences to overflow, the time is again noted. The flow of the pipe per minute = $\frac{\text{capacity of box}}{\text{time in minutes}}$.

(2.) Where the stream has to be gauged frequently, it is usual to put up a gauge board in a dam, formed either of clay, or of masonry, or concrete. The depth of water flowing over the sill is measured, and the flow is calculated from this by a formula which takes into account the form of the weir. The gauge board has a flat face on the upstream side, and the edges of the notch on the down-stream side are chamfered off, so as to give a sharp edge for the water to flow over. The velocity of approach in the stream is reduced as much as possible—i.e. the

gauge board is made to block up a considerable pool.

The *square notch* is the commonest form of gauge notch, and is the only one used for large streams. If the crest is not the full width of the stream channel it has 'end contractions,' and in that case the board should extend beyond the end of the crest not less than three times the depth of water over the weir, and the following formula should be used:— $Q = 3.33(l - 0.2h)h^{\frac{3}{2}}$, where Q = the flow in cubic feet per second, l = length of crest in feet, h = depth of water in feet. If the crest is the full width of the stream channel, the end contractions are 'suppressed,' in which case the formula becomes:— $Q = 3.33l \cdot h^{\frac{3}{2}}$. Where the flow varies greatly, a shorter V-shaped notch is sometimes cut in the centre of the larger one. Professor Jas. Thomson's V notch is specially suitable for varying flows, and if one V will not carry all the water, a series all set at the same level is used. The formula for a right-angled V is $Q = 2.54 h^{\frac{3}{2}}$, the units being the same as before.

Orifices are not capable of measuring through a great range, as the only variable quantity is the 'head,' or in the case of *submerged orifices* the difference of 'head' above and below the orifice. Their form is either circular or rectangular, and with care the error can be kept within one per cent. They are much used where a definite constant supply has to be delivered—e.g. in regulating compensation water. The head is measured from the centre of the orifice to the water surface above, and the formula for the flow from a circular orifice is:— $Q = 3.9d^2 \sqrt{h}$, d being diameter of orifice in feet, and Q and h being as before.

Great care must be taken in measuring the depth of water

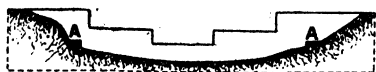


Fig. 1

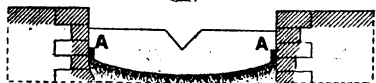


Fig. 2

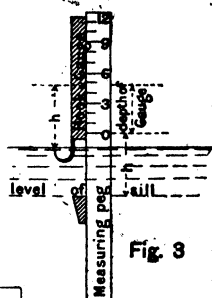


Fig. 3

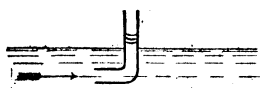


Fig. 4

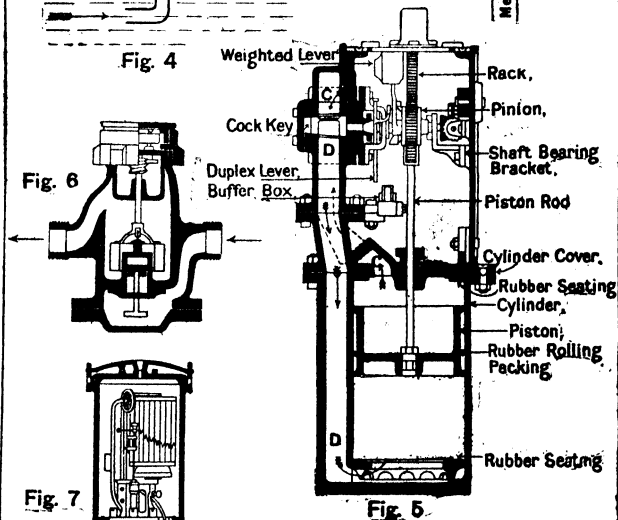


Fig. 6

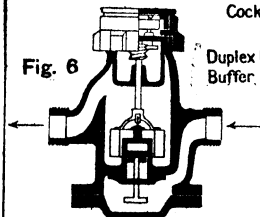


Fig. 7

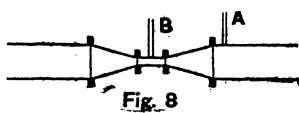
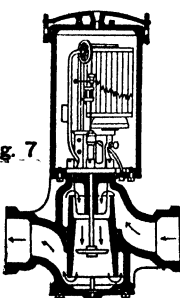


Fig. 8

Water-meters.
(For explanation, see text.)

when gauging. The depth required is that from sill level to the surface of 'still water' so called. Close to the weir the surface has a noticeable curvature, and measurements taken there would be inaccurate. In small streams, a simple method is to have a block on the gauge-board at each side, as at A, A (Figs. 1 and 2), level with the sill, or at a known height above it. In larger streams, a peg (or preferably two pegs, one at each side of the stream) should be carefully fixed, having a block level with the sill, or at a known height above it. As water rises up a foot-rule by capillary attraction, the most accurate readings are taken with a hook gauge, as shown in Fig. 3. It can be clearly seen when the point of the hook is just cutting the water surface.

In measuring streams from the cross-sectional area and the velocity, a position must be chosen where the channel is regular and the flow uniform. Several sections of the stream should be taken from which to form an average. The surface velocity at the centre of the stream can be found by timing floats, which should be of specific gravity only slightly less than water; otherwise they will float high and be affected by the wind. Burton says, 'The mean velocity may be taken as three-fourths the surface velocity.' A float with a sinker hanging below is sometimes used to get a mean between the surface and bottom velocities. Current meters are made in the form of screw propellers, having a train of wheels connected to a finger which moves round a dial, on which the number of revolutions is registered, and from this the velocity of the water is deduced. Pitot's tubes are of the form shown in Fig. 4, and from the height to which the water in the tubes rises above

the stream-level the velocity can be calculated. As well as being used to find the velocity in open streams, these tubes have been employed to calculate the flow from fire hydrants under pressure. It was proved that, with the Pitot tube midway between the centre and side of the pipe and attached to a Bourdon gauge, the discharge could be relied on to within 5 per cent. for a rate of flow varying between 20 and 400 gallons a minute (*Proc. Inst. C.E.*, vol. cxliii. p. 281).

Of Water in closed Pipes under Pressure.—In *positive meters* the volume of the water is directly measured by causing it to flow alternately into two vessels of known capacity. When the first vessel is full, the supply is turned into the other, whilst the discharge pipe draws from that previously filled. The number of times that each vessel is filled is recorded by a mechanical device, and on a dial the quantity of water (in gallons) is denoted. In Kennedy's meter (Fig. 5) the vessel is a cylinder; in Kent's it is of irregular shape. Positive meters are the only thoroughly reliable ones in all circumstances. In *turbine meters* (Fig. 6) the flow of water causes a turbine wheel to rotate, and from the number of revolutions recorded the quantity of water which has passed is deduced. With a constant and sufficiently large flow such meters are wonderfully reliable; but when the flow is below a certain limit the water passes through the turbine without causing any rotation, and as that limit is approached the meter records are low. Nevertheless, these meters are very commonly used by water companies and corporations for measuring water sold for trade purposes.

Examples of *valve meters* (Fig. 7) are Deacon's and Ginman's. A valve is so balanced by a counterpoise weight that it only opens

sufficiently far to allow the water to pass. An indicator shows to what extent the valve is open at any instant, and this is recorded on a diagram, which is drawn by clockwork past a pencil on the indicator. From this diagram, the quantity which has passed through in any period is deduced. Such meters indicate clearly any alteration in the flow, and are used rather to show the variation in flow at different times than the actual quantity of water which has passed through the meter. They are suitable for registering large flows, and do so with little loss of head. They are chiefly used as waste-water indicators.

The principle of the Venturi meter depends on the fact that where the velocity increases the pressure decreases. A pipe of large diameter is gradually diminished to a small diameter and gradually enlarged again (Fig. 8). The velocity through the portion of small diameter is much greater than that through the rest of the pipe, and consequently the pressure at the restricted part is much less than at the full diameter at either side. From the difference of pressures the velocity, and consequently the flow, can be calculated. These meters are used on large mains, and the loss of head caused by them is inappreciable. See TUDSBURY and BRIGHTMORE'S *Principles of Waterworks Engineering* (3rd ed. 1905); N. BEARDMORE'S *Manual of Hydrology* (1862); HENNEL'S *Hydraulic and Other Tables* (2nd ed. 1901); NEVILLE'S *Hydraulic Tables* (ed. 1875); and *Proc. Inst. C.E.*, vol. lxxx. p. 318, and vol. cxxvi. p. 24. See also WATER SUPPLY.

Water-melon, the fruit of *Citrullus vulgaris*, a tropical plant belonging to the order Cucurbitaceæ. In Britain it can only be grown in a warm greenhouse.

Water on the Brain. See HYDROCEPHALUS.

Water-ousel. See DIPPER.

Water Plants. See AQUATIC PLANTS.

Water Poet. See TAYLOR, JOHN.

Water-polo, as an organized sport, is controlled by the Amateur Swimming Association. A good swimming bath provides the best field of play, the water not being shallower than three feet. The distance between the goals may vary from 19 to 30 yds. The maximum width of the course is 20 yds. Goals must be 10 ft. wide, the cross-bar to be 3 ft. above the surface when the water is five feet or over in depth, and 8 ft. from the bottom when the water is less than five feet in depth. The ball may measure from 26½ to 28½ in. in circumference. A team consists of 7 players, and the duration of a match is 14 minutes—7 minutes each way exclusive of interruptions. There are at least eleven ways, not to speak of corollaries, in which it is possible for a player to commit a foul, so that the referee's duties are heavy. English clubs now number more than 600. In 1886 their number was 50.

Water-power. See HYDROKINETICS, and HYDRAULIC MACHINERY.

Waterproofing. See INDIA-RUBBER.

Water-rail. See RAIL.

Water-rat. See VOLE.

Waters, NATURAL. See WATER.

Water-scorpion. See WATERBUGS.

Watershed, or WATER-PARTING, the dividing ridge from which streams flow in opposite directions. It bounds the drainage area of a river.

Waterside. (1.) Village, Ayrshire, Scotland, on the Doon, 11 m. S.E. of Ayr; has ironworks. Pop. 1,400. (2.) A suburb of

Londonderry, Ireland, on the river Foyle.

Water-softening. Natural waters containing calcium and magnesium bicarbonates and calcium sulphate are 'hard'—i.e. do not readily lather with soap, and form a deposit or scale in kettles, boilers, etc. This is objectionable, both as wasting soap in textile industries and in impairing the efficiency of or even destroying boilers; so hard waters should be softened or the calcium or magnesium salts removed before use. The bicarbonates are removed by the addition of the calculated quantity of slaked lime stirred up with water into a 'milk,' all the calcium being precipitated as carbonate, $\text{Ca}(\text{HCO}_3)_2 + \text{Ca}(\text{OH})_2 = 2\text{CaCO}_3 + 2\text{H}_2\text{O}$. If calcium sulphate is present, the calcium is also precipitated as carbonate by the addition of soda ash, $\text{Na}_2\text{CO}_3 + \text{CaSO}_4 = \text{Na}_2\text{SO}_4 + \text{CaCO}_3$, the sodium sulphate formed being soluble and comparatively unobjectionable. In Dr. Clark's system the precipitation is done in large tanks, from which, after a suitable interval, the clear softened water is drawn off for use. In Porter's process a system of filter presses is used for the removal of the precipitate. In Atkin's scheme, adopted at the Southampton water-works, a combination of the above methods is employed. Milk of lime is fed continuously into the mixing tank. From this the water flows slowly through a large brick-lined softening tank, and on, over a cross-wall at its lower end, to a series of filters. Each of these consists of a number of perforated revolving discs, covered with filter-cloths, which effectually arrest that part of the precipitate which has not subsided in the softening tank. In the Maignen and Stanhope systems the water, after being mixed automatically with the requisite

chemicals, flows through iron tanks fitted with baffle-plates and shelves, upon which the precipitated salts are deposited, and which can be readily cleansed. The settling tank in the Kennicot water-softener, lately installed on the Union Pacific Ry., is a steel cylinder, 43 ft. high and 13 ft. diameter, with a conical bottom. The chemically treated water is forced down to the bottom of the tank within an inner conical partition (the diameter of which increases downwards), and rises up between the inner and outer shells to the soft water overflow, depositing the solid precipitate on them as the rate of flow diminishes with the increased cross section. Water of 21° of hardness is thus altered to that of 4° ; 57 lbs. of soda ash and $1\frac{1}{2}$ barrels of lime are used to soften 150,000 gallons of water in twenty-four hours. Another recent system, particularly well adapted for small installations, is the Bruun-Löwener softener. This differs from others chiefly in that the flow through the softening tank is intermittent. The hard water is led into an oscillating receiver, which tips its contents automatically into an intermediate chamber, together with a measured quantity of milk of lime or other chemicals. Each oscillation similarly opens valves, admitting the water into the settling tank, from which it is finally passed through a filter of wood wool into the storage tank of clear softened water.

Water-soldier (*Stratiotes aloides*). See STRATIOTES.

Water Spaniel. See SPANIELS.

Waterspout. When a whirlwind occurs over the sea or on expanses of fresh water, such as lakes or rivers, a waterspout results. Its characteristic feature is a tapering cloud, shaped like a funnel. It appears first at the under surface of the over-

hanging clouds, assuming the form of a small pendant, and apparently descends to sea-level, where the greatly agitated waters ascend to meet it. Waterspouts are most frequently met with in warm equatorial seas, where the winds are light or calm. They have, however, been observed in higher temperate latitudes, a considerable number having been recorded in the Gulf Stream in winter, during the prevalence of cold westerly winds blowing off the still colder adjacent land surfaces. The occurrence of the spout depends to a large extent on purely local causes, resulting in unstable atmospheric conditions, but in a great many cases the proximate cause is the importation of air with a temperature much lower than that of the water surface which it traverses. It is concluded that opposite motions coexist in the interior and exterior portions of a waterspout, and it is believed that the descending central currents are streams of rain, precipitated into the virtually empty core within the whirling spout. See H. C. Russell's 'Water Spouts on the Coast of New South Wales,' in *Trans. Roy. Soc., N.S.W.*, vol. xxxii. (1898).

Water Supply. Deep wells are not entirely of recent date. Joseph's Well, at Cairo, is 297 ft. deep, and the Chinese wells were sunk by almost present-day methods to a depth of 1,500 ft. Aqueducts were built not only in ancient Greece and Italy but throughout the Roman empire—in France, Spain, and Germany—and some of these are still in use. The water was conveyed by tunnel through hills, and generally crossed valleys on long series of arches, though the principle of the inverted siphon was clearly understood. Lyons in France was supplied by a lead pipe siphon from 12 to 18 in. in diameter and 9 m. long, which

worked under a 200-ft. head; but bridge aqueducts were generally constructed. With the introduction of cast-iron pipes in the beginning of the 19th century a great advance was made. Previously the mains had been bored-out trunks of trees—generally elm—and the diameter of the water way seldom exceeded seven inches. This necessitated several lines of pipe, laid side by side, to do the work which is now done by a single main of larger diameter. More recently, riveted and welded pipes of rolled steel have to a certain extent displaced cast-iron pipes, more especially those of large diameter or those for exportation. See WATER CHANNELS.

Typical Systems.—The following diagrammatic sections (Figs. 1, 2, 3) show different systems of supplying a town with water. Fig. 1 shows a *gravitation system* with two sources. The valley carrying the rainfall off a gathering ground, G, is dammed across to form a storage reservoir, R. From this the conduit *a b c d e f g*, with the town supply, starts, and here what is termed the 'compensation water' for the stream naturally fed from G is measured out and discharged. The town supply, if large in quantity, will probably be carried partly by conduit in open cut, or covered, *a b, e f*, or in tunnel, *c d*, at a gradient, and partly by pipes, *b c, d e, f g*, under pressure where valleys are crossed and the ground falls below the hydraulic gradient. This conduit terminates at a high level service reservoir, H.L.R. The water next passes to the filter beds F.B., and from them to the clear water tank C.W.T. From a screening chamber in the clear water tank the mains *h k* lead to town for distribution. A supply is also shown coming from springs, S.S., which are collected into a cistern, C, and brought by conduit direct to the clear water

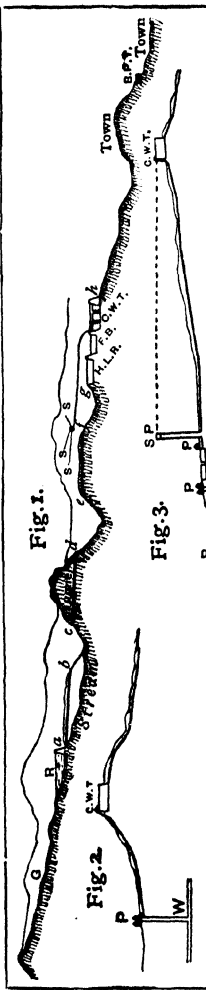


Fig. 1.

Fig. 2.

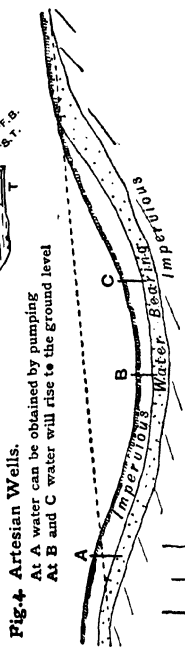
Fig. 2.

Fig. 3.

Fig. 3.

Fig. 4 Artesian Wells.

At A water can be obtained by pumping
At B and C water will rise to the ground level



Pump

Fig. 6. Supply drawn from infiltration gallery in bank of gravel bedded stream, either to be pumped or flow by gravitation.

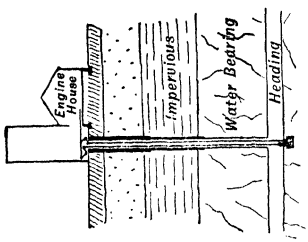
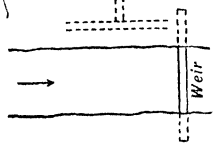


Fig. 5. Deep Well, lined through upper strata to prevent surface water infiltrating, with headings driven, and pumps shown.

Water Supply.—I. Figs. 1-6. (For explanation, see text.)

tank, since no filtration is necessary. A break pressure tank, B.P.T., with a capacity of only a few minutes supply, is shown, which regulates the water for a low-lying district of the town.

Fig. 2 shows a *deep well supply*. Pumps, P, lift the water from the well W, and force it to a clear water tank at an elevation sufficient to supply the district by gravitation. This water, being from a deep well, will not require filtration.

Fig. 3 shows a *pumped river supply*. From a river, R, the supply is drawn through a tunnel, T, and raised by pumps, P, to the surface. Here it may pass through settling tanks, S.T., and filter beds, F.B., if necessary, before being forced to the clear water tank which supplies the town. A stand pipe, SP, is sometimes used, to the top of which the water is lifted, and from there it flows by gravitation to the clear water tank. The stand pipe has the advantage of giving the pumps a constant head to work against, but in many cases it is dispensed with, the water being pumped directly into the distribution mains; and this practice is becoming more common.

Sources of Supply.—These may be either (1) surface water, or (2) ground water. A surface supply can be obtained by drawing from a stream, or spring, or lake. If the quantity of water required daily is small in proportion to the flow of the stream or spring at all times, all that is necessary is to divert from its ordinary course into a channel or pipe such quantity as is to be utilized. If, however, account has to be taken of regular seasons of small flow in the stream, and possible droughts, provision has to be made by storing the surplus water carried down in time of flood. A ground water supply is such as is obtained from deep wells.

Artesian wells get their name from Artois, the French province, where they have long been used. The name is applied to wells which have been sunk through some impervious stratum into a stratum bearing water under pressure, with the result that the water rises up the well and flows out at the surface (see Fig. 4). At Passy, near Paris, a well, 1,923 ft. deep, delivers 5½ million gallons a day 54 ft. above ground. In S. Dakota a well, 725 ft. deep, delivers 11½ million gallons a day. London obtains a large quantity of its supply from wells sunk into the chalk below the London clay. Headings or galleries are driven in the chalk from the bottom of the well so as to tap a large district, and all the water percolating through fissures in the chalk walls or roof of the heading flows along the heading to a sump at the bottom of the main well, and from there the pumps raise it to the surface (Fig. 5).

An ordinary town supply usually includes water for—(1) domestic and municipal supply, which means all used for drinking, washing, sanitary purposes, street watering, and fire extinguishing; partly (2) trade, since many manufacturers have private wells, and are not dependent on the public supply; only to a small extent (3) power; and seldom includes (4) irrigation. The quantity of a town supply is frequently reckoned as so much per head of population per day. In Great Britain the average may be taken as 33 gallons per head per day, varying between 20 and 50. In villages 15 is a fair supply. In the United States the amount varies from 30 to over 200. In estimating the necessary quantity to be provided, due allowance must be made for increase of population and a probable increased consumption per head,

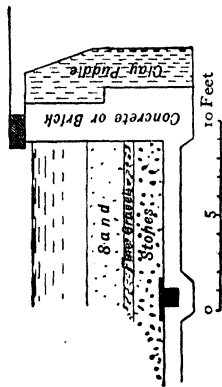


Fig. 7. Section of Filter Bed.

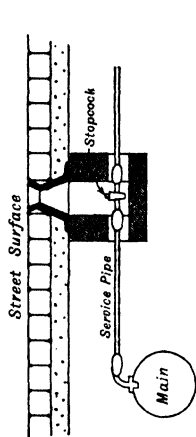


Fig. 9. Connection between Main Pipes and House Pipes.

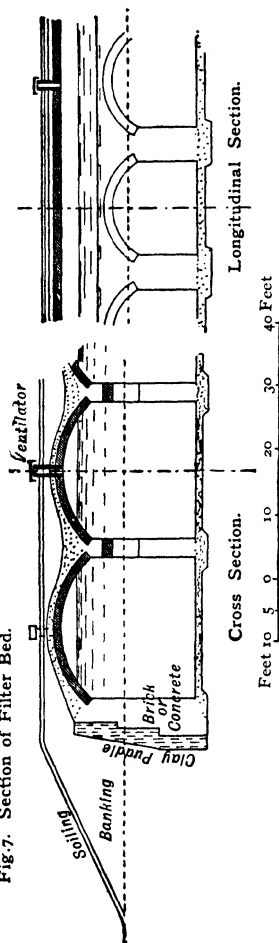


Fig. 8. Covered Reservoir or Clear Water Tank.

Water Supply.—II. Figs. 7-9. (For explanation, see text.)

which generally follows on the introduction of a new supply.

Rainfall.—Unless records for a large number of years are available, little can be done in the way of making an accurate estimate of the available rainfall, since different years vary greatly. An engineer wishes to know: (1) average annual rainfall; (2) rainfall of three consecutive dry years; (3) maximum length of drought, or very small rainfall; (4) maximum rainfall in a short time—say six hours or twenty-four hours. Statistics show that the minimum annual rainfall is about two-thirds of the average annual rainfall, whilst the average for three consecutive dry years is about four-fifths of the average annual rainfall. The maximum only comes into account when arranging the size of the waste weir, or by-wash channel; and it is not the annual maximum, but the maximum in a short period, which has to be provided for.

On a catchment area with considerable differences of level, it is generally found that the rainfall on the higher parts exceeds that on the lower. Consequently, in order to get useful records, rain-gauges have to be properly placed at different known elevations. In the Sierra Nevada this increase has been estimated as 6 inch per annum for each 100 feet rise.

Evaporation is generally expressed as equivalent to a loss of so many inches of annual rainfall. It varies much less from year to year than rainfall does, but it varies greatly in different districts, and at different seasons in the same district. In Great Britain waterworks engineers are in the habit of allowing about 14 or 15 inches for annual evaporation and percolation.

The geology of the district has to be studied when defining the

boundaries of a catchment area. It may happen that some pervious stratum overlying an impervious one will allow the water falling upon one drainage area to pass under hills and appear as springs in another, thus making the collecting ground considerably different from what it would be if judged by the conformation of the ground surface alone. If the surface be steep and of a hard, impervious nature, the rainfall will be quickly carried down to the valley, and the streams will be liable to floods and droughts. If, on the other hand, the ground has no great differences of level, and if the soil is loamy or sandy, and especially if it is well covered with vegetation, much of the rainfall will be retained in the ground, and the flow of the streams will be maintained more regularly throughout the seasons.

The number of days' supply which a reservoir should be capable of storing depends on the droughts of the district, and in Great Britain may be put down as from 150 to 180, and the collectable rainfall may be taken as 40 per cent. of the mean. The most accurate method of getting at the available water of a catchment area is from the gaugings of the streams. If stream gaugings of accuracy over a long series of years can be got, then no account need be taken of evaporation, absorption, and percolation, as they are already dealt with. The evaporation from the water surface of the reservoir should, however, be taken into account.

When the available water has been so estimated, a certain amount has generally to be guaranteed for compensation to the stream before any is extracted for supply. Compensation water is claimed by various bodies—*e.g.* riparian owners, farmers, mill-owners, manufacturers, and fish-

ing associations—and as the quality of the water is seldom of first importance to these claimants, a separate compensation water reservoir is sometimes arranged to store flood water, or such as would not be suitable for town supply. According to present parliamentary practice, the amount of compensation water to be provided is one-third of the average flow of the stream, and in certain cases particular clauses are inserted regarding an extra quantity for flushing purposes.

Intakes.—Where several springs, rising near one another, form the source of supply, it is common to build small masonry chambers round each, and lead pipes from these to a collecting well, from which the main pipe takes its start. Water can be collected from a river by building a low dam or weir across the channel, and drawing from the pool so formed. If the river has a gravelly bank and bed, a gallery with porous floor and walls is built close to the channel, and into this the water percolates. A conduit from the gallery leads to the pumps, by means of which the water is raised to the surface (Fig. 6). In lakes the intake is similar to a reservoir valve tower. Chicago is supplied from Lake Michigan through an intake 4 miles from the shore, at a point where the water is 40 ft. deep.

Conduits.—From the source of supply to the point of distribution the water may flow either in pipes under pressure, or in aqueducts with a free surface. Where the volume of water is large, aqueducts are used as far as possible, and pipes only where it is necessary to dip down below the hydraulic gradient. If the volume is not great, pipes are used throughout, and the line can generally be made shorter than if it is necessary to arrange for a constantly falling gradient, as in the

case of a channel where the water is not under pressure.

Purification.—Spring and well waters seldom need any purification. In sinking through the earth they have passed through natural filters, which have freed them of deleterious bacteria, though certain minerals may have been picked up. The hardness may be excessive, but as drinking water they are generally safe. Surface waters, on the other hand, frequently contain impurities in solution as well as impurities in suspension, and to remove these there are various methods of treatment.

Sedimentation.—Inorganic matter, such as particles of sand or clay, is carried along by the current in a stream, and as the rate of flow decreases they sink to the bottom, the smaller particles remaining in suspension longer than the larger ones. Not only is inorganic matter thus removed, but the number of the bacteria is also greatly reduced, probably owing to their being entangled with the falling particles, and so carried down.

Filtration.—Sand filters have regularly been used in Britain since 1829. Their form and action are as follows:—A watertight tank is constructed of concrete or brickwork, from 6 to 8 ft. deep, and of area depending on the amount of water to be filtered (see Fig. 7). Over the floor drain-pipes or channels lead to the outlet pipe, and over these drains is a depth of from 2 to 3 ft. of broken stones and gravel, decreasing in size upwards. Upon this gravel rests the bed of filtering sand, which is about 2 ft. thick. The water is slowly supplied to the filter, and is allowed to rise about 3 ft. above the surface of the sand. On sinking through the sand and gravel to the drainage channels, it escapes by the outlet pipe to a

clear water tank. A vertical rate of from 4 to 6 in. per hour is an average rate of flow, equivalent to from 2½ to 4 million gallons of water filtered per day per acre of sand. After some days (ten to twenty) the filter is found to work more slowly, as the upper layer of sand is getting clogged. The water is then run off, and about half an inch of the sand is skimmed off. A filter improves with age, and when the sand requires scraping it is not because the effluent is impure, but because the flow of water is so small that the working is uneconomical. The dirt which clogs the upper layers of sand is found to be a jelly-like deposit of organic matter as well as inorganic, and a bacteriological examination of the lower sand shows the same organisms, but in reduced numbers. It is this organic slime which is the effective agent in filtering, the sand merely acting as a mechanical support. During the cholera epidemic at Hamburg and Altona in 1892, Hamburg, with unfiltered water drawn from the Elbe above the town, had a death-rate of 134 per 10,000 in two months, whilst Altona, with sand-filtered water drawn from the Elbe below both the towns, had a death-rate of 21·3 per 10,000.

What are known as mechanical filters have recently been largely used in America, and with them water is forced through the bed of sand or crushed quartz at the rate of from 100 to 125 million gallons per day per acre of sand. In most cases a coagulant—aluminium sulphate—is used, which assists the filter, but the effluent is not so free from bacteria as that from slow sand filters.

Lately, roughing filters have been used on the Continent, in which the water passes through a bed of gravel about 12 in. deep before coming to the ordinary

sand filters, with the result that a greater quantity of water can be put through the sand filters.

Clear Water Tanks.—From the filters the water passes to a clear water tank, which feeds the distribution mains (see Fig. 8). The clear water tank or service reservoir is generally from 10 to 20 ft. deep, and built with brick or concrete walls, concrete floor, and frequently an arched roof supported on piers. Many engineers back the walls with clay puddle, and some put a layer under the concrete floor. As well as inlet and outlet pipes, there must be a scour pipe and an overflow, and the roof must be properly ventilated to allow the air to enter or escape freely as the water-level falls or rises. Over the roof earth is banked, with the result that the water is little affected by the outside temperature. Round the mouth of the outlet pipe are screens of fine meshed copper wire gauze. The clear water tank acts as a regulator between the filters, which supply at a constant rate, and the mains, in which the draught at some hours is much greater than at others.

Distribution.—The outlet pipes from the clear water tank lead to the arterial mains, which stretch over the area of distribution and feed the service mains of 6-in. diameter and less. These last are frequently connected so as to draw a supply from either direction, since 'dead ends' in the pipes are to be avoided. The service pipes leading into the houses are generally of lead, and are attached to the service mains with a brass ferrule screwed into the cast-iron pipe (see Fig. 9). Street piping includes stop valves, pressure-reducing valves, fire hydrants, street-watering hydrants, scouring valves, air valves, waste water meters, and trade supply meters.

Where the levels throughout the area of supply vary greatly, it is advisable to take some measures to keep up the pressure in the high districts, and at the same time to reduce the pressure in the low-lying districts, and thus prevent waste. This may be done with a pressure-reducing tank, which is a cistern placed at the level necessary to give sufficient pressure to the houses supplied. It is fed through a ball valve, so that when the draught is small and the cistern fills up, the valve closes with the rising float, and the supply is stopped. Pressure-reducing valves effect the same purpose. See Burton's *Water Supply* (1898).

Watertight Compartments. See SHIPBUILDING.

Waterton, CHARLES (1782-1865), English naturalist and explorer, was born near Wakefield. After spending twelve years (1812-23) in South America, he published *Wanderings in South America* (1825), which proved immensely popular. He also published *Natural History Essays* (three series, 1838-57), the second edition of which (1879) contains a memoir of their author.

Watertown. (1.) City, New York, U.S.A., co. seat of Jefferson co., on Black R., 65 m. N. of Syracuse. The rapids of the river furnish excellent water-power for its manufactures of wagons, carriages, paper, thermometers, steam-engines, woollen goods, silks, saddlery, farm implements, and air brakes. Pop. (1910) 26,730. (2.) Town, Massachusetts, U.S.A., in Middlesex co., 6 m. W. of Boston, of which it is a residential suburb. It manufactures rubber goods, paper, hosiery, soap, and automobiles. Pop. (1910) 12,875. (3.) City, Jefferson and Dodge cos., Wisconsin, U.S.A., on Rock R., 43 m. W.N.W. of Milwaukee.

Here is North-western University (1865), which had 241 students in 1910. Pop. (1910) 8,829. (4.) City, S. Dakota, U.S.A., co. seat of Codington co., on the Big Sioux R., 96 m. N. by W. of Sioux Falls; has large grain warehouses and elevators, machine shops, breweries, and tanneries. Pop. (1910) 7,010.

Water - Tube Boiler. See BOILER.

Waterville, tn., Kennebec co., Maine, U.S.A., on the Kennebec, at Ticonic Falls, 18 m. by rail N.N.E. of Augusta; is the seat of Colby Baptist College. There are railway workshops, and cotton and woollen factories. Pop. (1910) 11,458.

Water Violet (*Hottonia palustris*), a common British pond plant belonging to the order Primulaceae. It bears much-divided, subaqueous leaves, and whorls of pink and yellow salver-shaped flowers on a leafless stalk, which rises above the surface of the water.

Watervliet, city, Albany co., New York, U.S.A., on W. bk. of Hudson, 5 m. above Albany, and directly across the river from Troy. It is near the E. terminus of the Erie Canal and the S. terminus of the Champlain Canal. Here is a United States arsenal. Pop. (1910) 15,074.

Water Wheels. See HYDRAULIC MACHINERY.

Watford, tn., Herts, England, 18 m. N.W. of London, with an ancient church. Industries include breweries, malt works, and corn mills. Pop. (1911) 40,953.

Wath-upon-Deerne, urban dist., W. Riding, Yorkshire, England, 8 m. W. by S. of Doncaster; has coal mines, and oil, soap, and bottle works. Pop. (1911) 11,830.

Watkin, SIR EDWARD WILLIAM (1819-1901), English railway manager. As chairman of the Manchester and Sheffield, of

the South-Eastern, and of the Metropolitan Rys. (having been appointed to the last named in 1872), he strove to organize a continuous service from the south coast (Dover) to the north of England. Similar aims of unification led him to promote schemes for a tunnel between Dover and Calais, and between Scotland and Ireland. He represented Stockport in Parliament from 1864-8, and Hythe from 1874-95. He received a baronetcy in 1880.

Watlings Island, one of the Central Bahama Is., supposed to be the San Salvador (Guanahani) of the first landing of Columbus.

Watling Street, old Roman road, which, commencing at Dover, extended to London *via* Canterbury, and thence northwards in two diverging sections, one touching Carlisle and the other York. Fragments of the great highway are still to be traced.

Watson, HEWETT COTTRELL (1804-81), English botanist, was born in Yorkshire. In 1844 he assisted in preparing the *London Catalogue of British Plants*; and the first volume of his *Cybele Britannica*, his *magnum opus*, appeared in 1847, the term 'cybele' being intended to signify 'habitat.' In 1873-4 appeared his *Topographical Botany*.

Watson, JOHN (1850-1907), better known by his *nom de plume* of 'Ian Maclaren,' English author, born at Manningtree, Essex; was Free Church minister successively of Logiealmond; Free St. Matthew's, Glasgow; and Sefton Park Presbyterian church, Liverpool (retired 1905). He was Lyman Beecher lecturer at Yale (1896). His best-known works are *Beside the Bonnie Brier Bush* (1894; dramatized 1905), *The Days of Auld Lang Syne* (1895), *Kate Carnegie* and *The Mind of the Master* (1896), *The Potter's Wheel* (1897), *The Life of*

the Master (1901), *The Homely Virtues* (1903), and *The Inspiration of our Faith* (1905). See *Life*, by Sir W. Robertson Nicoll (1908).

Watson, SIR PATRICK HERON (1832-1907), surgeon-in-ordinary to Queen Victoria in Scotland, hon. surgeon to King Edward VII. in Scotland. Took part in the Crimean campaign as an assistant surgeon in the Royal Artillery. He was attaché to the special embassy of the Earl of Rosslyn on the occasion of the marriage of Alfonso XII. to Princess Mercedes (1878).

Watson, RICHARD (1737-1816), English bishop and controversialist, was born in Westmorland, and became professor of chemistry (1764) and of divinity (1771) at Cambridge. In 1782 he was appointed bishop of Llandaff. On his estate in Westmorland he encouraged new ideas in agriculture. His writings include *Apology for Christianity* (1776), in which he endeavoured to break a lance with Gibbon; and (1796) *Apology for the Bible*, a tilt at Tom Paine. See his *Anecdotes of the Life of Richard Watson* (1817).

Watson, ROBERT (1746-1838), Scottish adventurer, was born in Elgin, and claimed to have been intimate with Washington, and to have risen to the rank of colonel in the American army. After his return to England he became secretary to Lord George Gordon; he was subsequently wanted on a charge of high treason, owing to his avowed sympathy with the French revolution. In 1798 he escaped to France, where he became Napoleon's tutor in English, and principal of the revived Scots College. In 1817 he claimed to have purchased *The Stuart Papers* in Rome, but these were seized by the Vatican, and presented to the Prince Regent. He wrote a *Life of Lord George Gordon* (1795).

Watson, THOMAS (11557-92), English poet and scholar, was born in London. His first efforts were in Latin verse, in which he possessed amazing facility, and among other works was a Latin translation of Sophocles's *Antigone*. His first English poem (1582) was entitled *Passionate Centurie of Love*, a collection of 100 pieces in the style of Petrarch, manifesting the true frenzy of love; but whatever his verse had it lacked passion. In 1590 he published an eclogue in Latin and English on Sir Francis Walsingham. *The Tears of Fancie* appeared in 1593. Professor Arber issued Watson's *Poems* (1870).

Watson, WILLIAM (1858), English poet, is a native of Burley in Wharfedale, Yorkshire. His early verses were printed in the *Liverpool Argus* in 1875. His first book, *The Prince's Quest*, appeared in 1880, and his subsequent publications are *Epigrams of Art, Life, and Nature* (1884); *Wordsworth's Grave, and other Poems* (1890); *Poems* (1892); *Lyric Love* (an anthology, 1892); *Lachrymæ Musarum* (1892); *Excursions in Criticism* (1893); *The Eloping Angels* (1893); *Odes, and other Poems* (1894); *The Father of the Forest* (1895); *The Purple East* (1896); *The Year of Shame* (1896); *The Hope of the World* (1897); *For England* (1903); *Collected Poems* (1906); *New Poems* (1909); and *Sable and Purple* (1910).

Watson, WILLIAM WATSON, LORD (1828-99), was educated at Glasgow and Edinburgh universities, and was called to the Scottish bar in 1851. He was solicitor-general for Scotland (1874-6), and lord advocate (1876-80). In the latter year he was appointed a lord of appeal and created a life peer. He represented Glasgow and Aberdeen universities in the House of Commons from 1876 to 1880.

Watson-Gordon, SIR JOHN (1788-1864), Scottish portrait painter, was born in Edinburgh, nephew of George Watson, first president of the Scottish Academy, and assumed the name of Gordon. He exhibited from 1826 at the Royal Institution, Edinburgh, and was admitted member of the Royal Scottish Academy (1829), exhibiting there from 1830. He was elected A.R.A. (1841), and R.A. (1851), being finally elected president of the R.S.A. in 1850, and knighted. He was also an exhibitor at Burlington House, London, from 1827 till his death. His portraits of *David Cox* (Birmingham Art Gallery), *Sir Walter Scott* (National Gallery of Scotland), *Sir David Brewster* and *De Quincey* (National Portrait Gallery) are among his most famous. The Watson-Gordon professorship of fine arts was instituted in his memory at Edinburgh (1879).

Watsonia, a genus of S. African bulbous plants belonging to the order Iridaceæ. They bear long, somewhat rigid leaves, and sessile flowers, one to the spathe.

Watson's Bay, New South Wales, favourite resort of Sydney people, on S. shore of Port Jackson, 7 m. by road E.N.E. of Sydney. A portion on a cliff facing the Pacific Ocean is strongly fortified. Pop. 1,500.

Watt is the practical electric unit of power. It equals 10⁷ c.g.s. electro-magnetic units of power, and is the power conveyed when a current of one ampère passes through a conductor whose ends differ in potential by 1 volt, or when an ampère flows through a resistance of 1 ohm. Watts are measured as the numerical product of amperes and volts. $\text{Watts} = E \times C = C^2 \times R = E^2 \div R$. 746 watts = 1 horse-power.

Watt, SIR GEORGE (1851), Scottish botanist, born at Old Meldrum, Aberdeenshire. After

acting as assistant professor of botany at Aberdeen (1871-3), he obtained the botany chair in Calcutta University (1873), afterwards filling several government appointments. He was reporter on economic products to the Indian government 1887-1903, and from 1894 to 1903 had the control of the Calcutta Industrial Museum. He retired from the Indian service in 1906. His works include *A Dictionary of the Economic Products of India* (1889-96); (with Harold Mann) *The Pests and Blights of the Tea Plant* (2nd ed. 1903); *Indian Art at Delhi* (1903); and *Commercial Products of India* (1908), etc.

Watt, JAMES (1736-1819), Scottish engineer, and the improver and generally reputed inventor of the steam engine, was born in Greenock, and was sent to Glasgow (1754) to learn the making of mathematical instruments. After an attempt to settle in London, the university of Glasgow appointed him its mathematical instrument maker. He also acted as a surveyor of canals and engineer for the city waterworks; but the turning point of his life occurred when a Newcomen fire (i.e. steam) engine was sent to him by the university to repair. This suggested to Watt the idea of the separate condenser. He formed a partnership with Roebuck of the Carron Iron Works; but Roebuck got into financial difficulties, and transferred his share in Watt's invention to Boulton of Soho, Birmingham. The firm of Boulton and Watt was formed (1774), and an extension of the patent till 1800 was obtained in 1775. Watt's engine rapidly replaced Newcomen's, being more efficient and more economical. Watt made a long series of further improvements on the steam engine, including the expansion principle, parallel motion, and sun and planet motion, and finally the

application of the governor. He made experiments in the direction of locomotive engines, but opposed strenuously Trevithick's ideas regarding high pressure. In addition to this, Watt was an ardent student of chemistry, and it was long maintained on his behalf that he discovered the composition of water. He invented copying-ink (1780). See Smiles's *Lives of Boulton and Watt* (1865), Muirhead's *Mechanical Inventions of James Watt* (1854), and Pemberton's *James Watt* (1905).

Watt, ROBERT (1774-1819), Scottish bibliographer, was born in Ayrshire, and licensed as a physician. After he began to deliver lectures on medicine in Glasgow (about 1810) he compiled a *Catalogue of Medical Books* (1812), for the use of his students, which was the starting point for his elaborate *Bibliotheca Britannica*, which appeared in 1824.

Watteau, ANTOINE (1684-1721), French painter, born at Valenciennes. In 1702 he went to Paris, and worked on the decoration of the Luxembourg palace, where a study of Rubens's pictures revealed to him his own delight in sensuous exuberance and joy of life. De la Fosse gained entrance for him to the Academy (1717), and the patronage of Pierre Crozat, who introduced him to fashionable personages. Many of the figures of his *Fêtes Galantes* and *Fêtes Champêtres* are drawn from a company of Italian comedians, whose natural gestures he painted in delicate, broken tones of red, pale blue, and white. The gaiety of his art lies mainly in his sunlit colours and great purity of tone; its beauty in his grace of line and delicate arrangement of background. His finest pictures are to be found in the La Caze Collection, Louvre; in Sans Souci at Potsdam; in Berlin; and in the Wallace Collection in London; and a good collection of his draw-

ings is in the British Museum. De Goncourt published a *Catalogue Raisonné* of his works in 1875. See *Lives* by Mollett (1883), Volbehr (1885), Dargenty (1891), and Mantz (1892).

Wattenscheid, tn., Westphalia, Prussia, 5 m. E.N.E. of Essen; has coal mines. Pop. (1910) 27,658.

Wattle. See ACACIA.

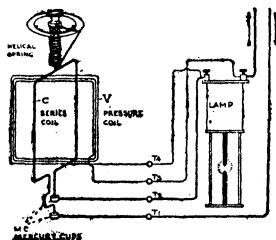
Wattle-bird (*Anthochaera carunculata*), one of the honey-eaters. It is confined to Australia, but another species is Tasmanian. The distinguishing feature is the elongation of the wattles.

Wattmeter, an instrument for measuring the units of electrical power, or the rate at which work is being done between two points in a circuit.

Watts = volts $\times$ ampères.

Volts are usually measured by a voltmeter, and ampères by an ammeter. Hence if there be an ammeter in the circuit between the points and voltmeter across the points, the watts may be got by multiplying the readings of the voltmeter by those of the ammeter. Therefore, an instrument which is to measure the watts must partake of the nature of both these instruments. It must consist of a pressure coil of thin wire placed across the mains or feeds, and a coil of thick wire for measuring the current strength placed in series with the lamps or other apparatus using up the electrical energy. The sketch shows the arrangement diagrammatically. Siemens's wattmeter is an instrument constructed on this principle. C, the series coil, is of thick wire, and is free to swing against the action of the helical spring, while contact is effected by the free ends moving in cups of mercury connected with the feeds. V, the pressure coil, is of fine wire, and is fixed. When no current is passing, coil C is at right angles to coil V. V consists of many

turns of thin wire of sufficient resistance to prevent the pressure being altered when the coil is connected across the dynamo terminals; C is of thick wire of low resistance, so that the current strength may be little altered by its insertion in series with the lamps. When this apparatus is connected to the circuit and current passes through both coils, C tends to turn so that its magnetic field may become parallel to that of V. The turning of the movable coil is proportioned to



Wattmeter.

$E \times C$ —i.e. to the watts. Hence by accurate calibration the instrument may be made to indicate the watts used. In this form of instrument there is a considerable amount of self-induction in the coil V, which interferes with accurate working when used for alternating currents. In more recent forms the heavy current coil is fixed, and the fine wire coil is made small and light, being either suspended by fine wires, or rotating on steel centres in jewelled bearings, and controlled by flat spiral springs. A large non-inductive resistance is joined in series with the fine wire coil. See ELECTRIC CIRCUIT—*Alternating Current Circuit*; also *Electrical Engineering Measuring Instruments*, by Aspinall Parr (1903).

Watton, par. and mrkt. tn., Norfolk, England, 20 m. w. by s.

of Norwich. On the S. side of the town is Wayland Forest, believed by many to have been the scene of the murder of 'The Babes in the Wood.' Pop. (1911) reg. dist. 5,546.

Wattrelos, comm., France, in Nord dep., 7 m. N.E. of Lille, near the Belgian frontier. Pop. 27,500.

Watts, ALARIC ALEXANDER (1797-1864), English poet, was born in London, took to journalism, and brought out (1824) the *Literary Souvenir*, for which he secured the co-operation of Scott, Wordsworth, Coleridge, Præd, and others. He published two volumes of his own verse, *Poetical Sketches* (1822) and *Lyrics of the Heart* (1850). In 1854 he received a pension from the civil list. See *Life* by his son (1884).

Watts, GEORGE FREDERICK (1817-1904), English painter and sculptor, was born in London. His first exhibited works were two portraits of ladies, and a picture of a wounded hero, at the Academy in 1837. In 1842 Watts gained a prize of £300 in the competition for the decoration of the new Houses of Parliament, with his *Caractacus being led in Triumph through the Streets of Rome*, which enabled him to spend the next two years in Florence. Here he laid the foundation of his lifelong friendship with Lord Holland, then British ambassador, and for whom he painted a portrait of Lady Holland (exhibited 1848). In Florence he steeped himself in the Italian art of the renaissance, being chiefly influenced by the Venetians, especially Tintoretto, from whom he learned colour. He returned to London in 1846, and took part in another House of Lords competition, this time winning a prize of £500 with a cartoon, *Alfred inciting his Subjects to prevent the Landing of the*

Danes, which led to a commission from the government to paint the *St. George and the Dragon* fresco, in the Hall of Poets. About this time Watts struck out into the symbolical work which forms his message to the age—the power of love and the fallacy of the fear of death, the danger of riches and the cruelty of greed. The most notable of this group are *Faith*, *Hope*, and *Charity*, *Love and Life* (1885), *Love and Death* (1877-96), *Love Triumphant* (1898), and the trilogy of *Eve*. Watts executed numerous portraits of the distinguished men of his day, including Gladstone, Lord Salisbury, the Duke of Devonshire, Tennyson (the finest of all), Lord Stratford de Redcliffe, Lord Lyndhurst, Swinburne, and Garibaldi. Although Watts's sculpture amounts to only some half-dozen pieces, yet these works are characterized by grandness of conception, nobility in style, and boldness and breadth of execution. Such works are *Hugo Lupus*, at Eaton Hall; *Physical Energy*, in Rhodesia; and *Bishop Lonsdale*, in Lichfield Cathedral. Watts presented the greater part of his work to the nation. He was elected an Academician in 1867. See Monkhouse's *British Contemporary Artists* (1889), Bate-man's *G. F. Watts* (1901), G. K. Chesterton's *Watts* (1904), and Mrs. Russell Barrington's *G. F. Watts: Reminiscences* (1905).

Watts, HENRY (1815-84), English chemist, was born in London. In 1846 he became assistant to Fownes, professor of chemistry in University College, London, but an impediment of speech prevented his academic preferment. He translated (1848-72) Gmelin's *Handbuch der Chemie*, and edited the Chemical Society's *Journal* from 1861. In 1863-8 he brought out a *Dictionary of Chemistry*, which (revised) is still a standard

work. He also brought out editions of Fownes's *Chemistry*.

Watts, ISAAC (1674-1748), English sacred poet, was born at Southampton, and was a private tutor from 1696 to 1702. He was at the same time assistant to Dr. Chauncy, Independent minister, whom he succeeded in 1702. Watts's authorship begins with *Horæ Lyricæ* (1706), and is continued in *Hymns* (1707), *Psalms and Hymns* (1719), and *Divine and Moral Songs for Children* (1720). The best of his sacred lyrics—simple, direct, and warmly evangelical—rank among English classics. Many of the children's hymns are excellent. Watts's *Logic* (1725) was for a time a university text-book. He followed it in 1741 with a supplement, *Improvement of the Mind*. His *The World to Come* (1738) was for long a household book. Watts's collected *Works* (6 vols.) appeared in 1753. See Johnson's *Lives of the Poets* (1779-81), and *Memoir* by Thomas Gibbons (1780). A library edition of the *Works*, with prefatory life (9 vols.), was published in 1812. Thomas Milner edited *Life, Times, and Correspondence* (1834). Southey prefixed a memoir to an edition of *Horæ Lyricæ* (1837).

Watts-Dunton. **WALTER THEODORE WATTS** (1832), English critic and poet (assumed late in life his mother's name of Dunton), was born at St. Ives, Huntingdon. For thirty years or more he lived in Upper Putney, in companionship with his friend A. C. Swinburne, the poet. Whilst still a boy he was brought into touch with gipsy life, and this lighted a flame in his imagination which was revealed in the romance of *Aylwin* (1898), and in the dialect narrative poem *The Coming of Love* (1897). He has also written much in the *Athenæum* and *Encyclopædia Britannica*, in *Ward's English Poets*,

and *Chambers's Encyclopædia*. See Mr. James Douglas's *Life* (1904).

Wattwil, comm., Switzerland, canton of and 16 m. s.w. of St. Gall. Pop. (1910) 5,730.

Wauchope, ANDREW GILBERT (1846-99), British general, was born at Niddrie, near Edinburgh. He saw active service in Ashanti (1873), and was wounded; took part in the Boer war (1880) and the Egyptian campaign (1882); ascended the Nile with the expedition to relieve Gordon in 1884; and was at Omdurman in 1897. During the Boer war of 1899-1902 he was in command of the Highland Brigade, and was killed while leading the Highland Brigade at Magersfontein.

Waugh, BENJAMIN (1839-1909), founder of the National Society for the Prevention of Cruelty to Children, was born at Settle in Yorkshire, entered the Congregational ministry in 1862, and held pastorates at Newbury and Greenwich. In 1884, on the formation of a London Society for the Prevention of Cruelty to Children, he became its honorary secretary, and, four years later, he established it on a national basis. It was largely on the information gathered by him that the agitation was based which led to the passing of the Criminal Law Amendment Act in 1885, and it was by his personal efforts that, on the report stage of that measure, the House of Commons agreed to empower magistrates to take the evidence of children who were too young to understand an oath. In 1889 his legislative achievements culminated in the passing of the Act for the Prevention of Cruelty to and the better Protection of Children. Under this act the society has dealt with nearly 400,000 cases of ill-treatment. Mr. Waugh edited the *Sunday Magazine* from 1874 until 1896.

Waugh, EDWIN (1817-90), English poet, was born at Rochdale, Lancashire, and devoted himself to literature. He was a powerful singer in the Lancashire dialect, which he handled with loving care, but yet with such discrimination that the reader is never wearied. Of his prose works the best are *Factory Folk during the Cotton Famine*, *Besom Ben Stories*, and *The Chimney Corner*; while *Lancashire Songs*, collected in 1859, have had an enduring popularity. He was not so successful when he ventured beyond the Lancashire dialect.

Waukegan, summer resort, cap. of Lake co., Illinois, U.S.A., on w. shore of Lake Michigan, 35 m. N. of Chicago; has a good harbour. Brass wire and iron goods, leather, beer, and sugar are manufactured. Pop. (1910) 16,069.

Waukesha, health resort, cap. of co. of same name, Wisconsin, U.S.A., on Little Fox R., 15 m. w. of Milwaukee; has magnesian springs, the water of which is exported, and is the seat of the Carrol Presbyterian College. There are bridge-building works, steel works, and breweries. Many prehistoric (probably Indian) mounds still exist in the vicinity. Pop. (1910) 8,740.

Wausau, city, Wisconsin, U.S.A., co. seat of Marathon co., 157 m. N.N.W. of Milwaukee, on Wisconsin R. Big Bull Falls supply water-power for the manufacture of lumber, furniture, paper, machinery, and leather. Pop. (1910) 16,560.

Wave. The most familiar kind of wave is the water wave or ripple, which is obviously a state of motion passing over the surface of the water with a certain speed. The rate of propagation of the wave is something quite different from the rate of motion of the water, every part of which simply moves up and down and

slightly forward and backward as the wave passes. Again, water waves may differ in wave length—that is, in distance between corresponding parts of successive waves, say, from crest to crest. They may differ in period—that is, in the time each particle of water takes to go through all its motions as one wave passes it. This periodic time is also the time the wave itself takes to move through the distance equal to the wave length; hence the very important relation, true of all wave motions, that the velocity of propagation of a wave is equal to the wave length divided by the periodic time. Finally, waves may differ in form. Similar characteristics are possessed by all kinds of wave motion, which may be generally defined as the propagation of a particular configuration or state of strain through a system of particles or other material system. The existence of wave motion requires first a disturbance, and second a recovery, of the system towards its original undisturbed condition. The disturbance of the hydrostatic level of water is followed by a natural tendency to recover that level condition, and there are two forces which aid in this recovery. The one is gravity, or the weight of the heaped-up water; and the other is the surface tension, which produces an inward pressure over every curved surface. The latter becomes important only when the waves are very short. Kelvin distinguishes between ripples and waves—the ripples being short and running mainly by surface tension, while the waves are propagated mainly by gravity. The shorter the ripple the quicker it runs. On the other hand, gravity makes the longer waves travel more quickly. There is a critical wave length, about seven-tenths of an inch, for which gravity and

surface tension have equal influence, and the wavelet ripple of this wave length travels with the minimum speed of 9.34 inches per second. The product of the wave lengths measured in inches of any pair of corresponding wave and ripple is .505. Ripples so tiny as to be unobservable except in their effect in slightly dimming the surface of a hitherto perfectly still sheet of water will be propagated over the surface with considerable velocity.

Somewhat similar to the propagation of ripples by surface tension is the propagation of transverse waves along a stretched string. In this case, however, the speed of propagation is the same for all wave lengths. Its value is given by the formula $v^2 = T/D$, where T is the tension and D the mass in unit length of the string. The velocity being constant for the same tension, it follows that the wave length is proportional to the period. It is more convenient, when dealing with rapid vibrations, to measure rate of vibration by the number of vibrations per second instead of the time of one vibration. This quantity is called the frequency, and is the reciprocal of the period. Thus we have for the stretched string the important result that under constant tension the wave length is inversely as the frequency. See SOUND.

Any molecular disturbance in a material substance will be propagated through it as an elastic disturbance, and a rhythmic sequence of such disturbances will form a train of waves. The disturbance may be a change of density or a change of form, or a change involving both. In fluids such as air or water the elastic disturbance can be only one of change of bulk or density. It is then called a pure condensational rarefactional wave. The most familiar illustration of this kind

of wave is the sound wave in air, the speed of propagation of which is measured in terms of the formula $v^2 = E/D$, where D is the density and E is the resistance to compression or the incompressibility of the air. A similar formula holds for the propagation of condensational waves through water. The greater density of the water is overbalanced by its much greater incompressibility as compared with air, so that sound travels in water with a speed of 4,700 feet per second, whereas the velocity of sound in air is only 1,090 feet per second.

When we pass to the case of solids, we have to do with two kinds of elasticity—the rigidity, or resistance to change of form, and the incompressibility, or change of bulk. In all cases the velocity can be expressed by means of a formula of the type $v^2 = E/D$, where D is the density and E is the particular value for the resistance to the strain involved. Thus there is a purely distortional wave, whose velocity depends upon the rigidity of the material; and there is a compressional wave, whose velocity depends upon both the rigidity and the compressibility. The latter travels at a rate which may be in certain cases twice the rate of the former. But in addition to these there is a third type of wave, which travels along a thin, long bar of the material, say a copper or iron wire. This, which may be called the longitudinal wave, depends upon Young's modulus. Its velocity is always higher than the velocity of the distortional wave, and may be higher than that of the compressional wave. Lord Rayleigh has also pointed out the existence of a surface wave propagated along the face of an extended elastic solid. Its velocity is somewhat smaller than that of the compressional wave. This

surface wave has never been observed, except possibly in the case of earthquakes, which give rise to surface waves passing outward over the earth's surface with speeds varying from two to three miles a second.

It is generally admitted that the wave motion which constitutes light consists of purely transverse vibrations. If we consider the æther or luminiferous medium to be an elastic solid of extreme tenuity, we must assume it to be incompressible so as to get rid of the compressional wave. The high velocity of light (186,400 miles per second) would then imply a high rigidity or a very small density, or both combined. There are difficulties in realizing how a purely distortional wave can begin to be propagated in an absolutely incompressible medium. As Kelvin has expressed it, it is infinitely improbable that the æther can be infinitely incompressible. Yet we have no evidence in optical phenomena of there being any compressional wave. If, however, Maxwell's theory of the electric nature of light be true, we must regard the vibrations which constitute light as being electric and magnetic. Such vibrations may exist quite apart from any elastic properties that may be assigned to the medium. The experimental proof by Hertz, that electro-magnetic waves do exist, and are propagated with a velocity approximately equal to that of light, goes far to establish the truth of Maxwell's theory. Our eye recognizes the slow oscillatory motion of waves and ripples on water; our pulses beat in time with waves propelled through the arteries and blood-vessels; our seismometers record vibrations of the earth's surface; our ear is sensitive to the fairly rapid periodicity of sound waves; we can construct apparatus to

record for us the still more rapid vibrations of electric distribution which form the basis of wireless telegraphy; our eye responds to the 500 million million vibrations of light which stimulate it every second of time; and by appropriate means we can demonstrate still more rapid vibrations to which our eye is not sensitive. Passing down to slower periodicities, we have the tidal waves twice a day, the annual variation of the seasons, the eleven-year sun-spot cycle—all of which, if not distinct wave motion, can be represented diagrammatically in wave form. Water waves are discussed in Lamb's (1895) and in Basset's *Hydrodynamics* (1888); sound waves in Rayleigh's *Theory of Sound* (1894-6); æther waves in Larmor's *Matter and Æther* (1900), and treatises on light generally; electric waves in Maxwell's *Electricity and Magnetism* (1892); J. J. Thomson's *Recent Researches in Electricity and Magnetism* (1893); Heaviside's *Electrical Papers* (1892); and Drude's *Optics* (1902).

Waveney, riv. of England, in cos. of Norfolk and Suffolk. Its headwaters are connected with those of the Little Ouse, and its lower waters with the sea by the Yare, which it joins 4 m. s.w. of Great Yarmouth. Length, 50 m.

Waverley, suburb of Sydney, New South Wales, 4 m. E. of the city; with boot and baking-powder factories. Pop. 12,500.

Wavre, tn., Brabant prov., Belgium, 16 m. s.e. of Brussels; has tanneries and breweries, and manufactures paper, lace, etc. Here, on June 18, 1815, the Prussians prevented Grouchy from joining Napoleon. Pop. 8,500.

Wax includes various products derived from the animal, vegetable, and mineral kingdoms. In general, waxes are lighter than water; melt on heating to a limpid liquid, and are combustible, being

not unlike fats, but are harder and more lustrous in appearance. They are insoluble in water and cold alcohol, but are more or less soluble in boiling alcohol, from which they often crystallize. They also dissolve in ether, chloroform, petroleum spirit, and turpentine, and are normally white, although some of them—such as beeswax, laurel wax, carnauba wax—contain in their crude form a little colouring matter. In chemical composition the animal and vegetable waxes are, as a rule, esters, formed by the union of fatty acids and alcohols of high molecular weight, whilst the mineral waxes are hydrocarbons. The most important waxes are beeswax, which is a secretion of bees, derived by them from flowers. It consists substantially of 12 per cent. of cerotic acid, along with 88 per cent. of myricin, which is myricyl palmitate. It can be bleached by exposure to air and moisture, or by the cautious use of oxidizing agents. Chinese wax, composed of ceryl cerotate, and produced by the attacks of an insect (*Coccus pela*); Japan wax, glyceryl palmitate, from the seeds of *Rhus succedanea*; carnauba, or Brazilian wax, a complex mixture of high alcohols, acids, and hydrocarbons from the leaves of *Corypha cerifera*; and myrtle wax, from the berries of *Myrica cerifera*, are the principal waxes of vegetable origin. Spermaceti is nearly pure cetyl palmitate, and is a hard, very glistening, pearly wax, found in the head of the sperm whale, *Physeter macrocephalus*. Ozokerite is a natural hydrocarbon wax found in Galicia, and is very largely used in candle-making. In a semi-refined condition it forms a yellow granular wax, known as ceresin, and used as a substitute for beeswax. Paraffin wax is also a hydrocarbon, and is obtained from the

crude oils got on distilling the shales found in Scotland, and also from American petroleum. When refined it is white, semi-translucent, and in the best grades hard, and with a sonorous ring. It is chiefly used for the manufacture of candles, in making waxed papers, and as an insulator. Waxes are also employed in the finishing of textile fabrics, making of ointments, pomades, furniture polishes, waxed paper, and medicinal plasters, as well as for laundry and household uses. See SEALING WAX, and for books of reference OILS AND FATS.

Waxahachie, tn., Texas, U.S.A., co. seat of Ellis co., 28 m. s. by w. of Dallas. It has cotton, flour, and lumber mills, and manufactures of machinery and cottonseed oil. Pop. (1910) 6,205.

Wax-bill. See WEAVER-BIRDS.

Wax - myrtle (*Myrica cerifera*). See MYRICA.

Wax-palm, a name given to various species of palm, especially to *Copernicia cerifera* or *Corypha cerifera*, the wax-palm or carnauba palm of Brazil and other parts of tropical America. The leaves of this plant, which are coated with wax, are cut off when young, dried in the sun, and then shaken. The wax falls as a fine powder. This powder is then melted and formed into cakes. The wax is extensively used in the manufacture of candles. The so-called palm-tree wax of commerce is obtained from two plants belonging to allied genera—*Klotzstockia cerifera* and *Ceroxylon andicolum*. These palms secrete the wax on their stems, from which it is obtained by scraping. One tree is said to yield on an average about twenty-five pounds of wax.

Wax-plant, or HONEYWORT (*Cerinth major*), a name given to plants belonging to the genus

Cerithe, a subdivision of the order Boraginaceæ. The popular name is derived from an old idea that bees visit the flowers for wax.

Wax-tree, a name given to *Vismia guianensis*, the American gamboge or gutta-gum tree. This little tree or shrub is a native of tropical America, and requires stove heat in Britain. It bears corymbs of yellowish flowers in late summer.

Waxwing (*Ampelis garrulus*), a bird which breeds within the Arctic circle, but is a not infrequent visitor to Great Britain. It reaches a length of about seven and a half inches, and has an erectile crest, long pointed wings, and a short tail. The general colour of the plumage is grayish brown, but the head is marked with black and chestnut, and the wings and tail are blackish, with yellow and white markings. About eight of the secondary feathers of the wing, and in some cases some of the tail feathers, have red waxlike tips at the shafts, hence the common name. Waxwings feed on insects and berries, and have a trilling note. Waxwings belong to a peculiar family, the Ampelidæ, and are probably related to the shrikes.

Waxy or Albuminoid Disease, a degeneration resulting usually from long-continued suppuration or from chronic wasting disease. The organs affected most frequently and most markedly are the liver, spleen, and kidney; but the lymphatic glands, the intestinal mucous membrane, the pancreas, the thyroid gland, the heart, and the lungs may also share in the degeneration. In an advanced stage of the disease the parts present the appearance of having been soaked in wax or similar translucent material. The general symptoms are anæmia, debility, and cachexia. Enlargement of the liver is usual, and

the degeneration of the kidney leads to albuminuria, dropsy, and uræmia. The prognosis is always extremely bad, and is hopeless when the disease is far advanced. A liberal diet, containing abundance of nitrogenous food and potassium salts, should be prescribed. The drugs chiefly indicated are iron, cod-liver oil, and potassium salts.

Way, RIGHT OF. See RIGHT OF WAY.

Wayao, or AJAWA, a Bantu tribe, the most important native people of Mozambique. They have also spread into Nyasaland and German E. Africa. They are a hard-working race, but are warlike and addicted to cannibalism. Chuma, the servant of Dr. Livingstone, belonged to the Ajawa.

Waycross, tn., Georgia, U.S.A., co. seat of Ware co., 53 m. w. by N. of Brunswick. It has railway construction and repairing shops, lumber mills, foundries, and manufactures of naval stores, machinery, etc. Pop. (1910) 14,485.

Wayfaring Tree, or HOBBLE BUSH (*Viburnum lantanoides*), is an American shrub with a straggling habit. It bears serrated ovate leaves, and in May cymes of large handsome white flowers, followed by dark-red berries.

Wayland the Smith, a hero in Germanic mythology. After learning the art of forging weapons, he went to the trolls, who taught him smelting and the secrets of the mixture of metals. He fell into the power of King Nidung, who mutilated his feet. Wayland terribly avenged himself, and then fled to Valhalla by making himself a pair of wings. He is said to have resided for a time in England, and his 'cave' is shown at Ashdown in Berkshire. See Sir Walter Scott's *Kenilworth*, ch. 13, notes; Kipling's *Puck of Pook's Hill* (1906); Simrock's *Wieland der Schmied* (1835);

and Müller's *Mythologie der deutschen Heldensage* (1886).

Wayne, ANTHONY (1745-96), known as 'Mad Anthony,' American general during the war of independence, was born at East-town, Pennsylvania. The war fired his blood, and raising a regiment of volunteers he went to Canada, where he did good work at Three Rivers. He next distinguished himself at Ticonderoga. After that he became associated with Washington, gained laurels at Brandywine, Germantown, Valley Forge, and Monmouth. Though defeated at Paoli, he retrieved the reverse by the brilliant success of Stony Point. After the war he was appointed general-in-command of the army, gained victories over the Indians of the north-west frontier, and signed an important treaty with them.

Waynesboro, bor., Pennsylvania, U.S.A., in Franklin co., 51 m. s.w. of Harrisburg. It manufactures tinplate, flour, woollen goods, iron products, malted liquors, glass, and steel. It is in a rich coal, oil, and natural gas district. Pop. (1910) 7,199.

Ways and Means, COMMITTEE OF. In the House of Commons all loans, duties, taxes, tolls, revenue, and imposts must be first considered by a committee of the whole house, whilst the imposition of taxation for the service of the year is reserved for the Committee of Ways and Means. The chairman is elected by the House of Commons on the assembling of every new Parliament. He also acts as deputy Speaker.

Ways and Means Advances. See PUBLIC DEBT.

Wazan, or **WEZZAN**, tn., Morocco, 45 m. N.N.W. of Fez; is a holy city and the residence of the grand shereef. Pop. 10,000.

Wazirabad, munic. tn., Gujranwala dist., Punjab, India, 60

m. N. by W. of Lahore; manufactures steel, iron, wax, and boats. The Chenab is spanned opposite Wazirabad by a fine railway bridge, the Alexandra bridge (1876). Pop. 18,000.

Waziri, a large and semi-independent Afghan nation who occupy the Waziri Mts. from Thal to the Gomal Pass, near the Indian frontier. There are, according to Lord Roberts, 40,000 fighting men; Macgregor and other authorities give from 44,000 to 50,000.

Weald, the triangular area lying between the North and South Downs, and forming part of Sussex, Surrey, Kent, and Hampshire. It was formerly covered by the Forest of Andredsweald, and is still wooded in places. It is composed mainly of Lower Cretaceous strata. The Wealden beds cover most of the district, and are subdivided into the Hastings Sand and the Weald Clay. They form the back of a long anticline, which is the principal structural feature of the geology of this part of England. The Hastings Sand is from 1,000 to 2,000 ft. in thickness. At the base of it lies the Ashdown Sand, which forms Crowborough Beacon. Over this comes the Wadhurst Clay, containing layers of hard concretionary calcareous sandstone — the Tilgate Stone. The uppermost part of the series is the Tunbridge Sand, certain beds of which have yielded remains of iguanodon and other fossil reptiles, first discovered by Dr. Mantell. The Weald Clay contains occasional shelly or arenaceous beds full of freshwater mollusca (*Unio*). Beds of the same age are exposed in the Isle of Wight near Atherfield Point, and at Swanage in Dorset, and are continued across the English Channel into the north of France.

Wealdstone, urb. dist., Middlesex, England, about 2 m. N. of

Harrow-on-the-Hill. Pop. (1911) 11,923.

Wealth. The term wealth is at once simple and complex, so simple that, as John Stuart Mill said in his *Principles of Economics*, and was rebuked by Ruskin in *Unto this Last* for saying, 'Every one has a notion, sufficiently correct for common purposes, of what is meant by wealth,' so complex that few have agreed as to its proper definition in the domain of economics. Etymologically the word is derived from the Anglo-Saxon *weal*, well-being. In economics the simplest definition which emerges from volumes and generations of discussion is that 'Wealth consists of commodities which can be appropriated, and which have value in exchange.' Thus, one of the primary essentials of life, pure air, is intrinsically but not economically wealth, for while it 'avails towards well-being,' it cannot be appropriated, and has therefore no exchange value. On the other hand, a tawdry print, which may actually degrade well-being, is economically 'wealth,' because it can be sold for a penny, and therefore has value in exchange. Attempts have been made to form complete definitions, such as that 'Wealth con-

sists of consumable articles which require labour for their production and can be appropriated and exchanged,' but this is obviously imperfect, for the Western prairie, untrodden by man, is an exchangeable commodity, and a factor in Canada's economic wealth, although it has never known labour, and a piece of rich ore found lying on the surface of the ground and won without labour is of exactly the same economic value as a similar piece of ore got with arduous labour from the depth of a mine. Economic 'wealth' is seen to be a purely commercial term which has no necessary relation to well-being. It could only become synonymous with well-being in a society in which commercialism had been overthrown.

From time to time various estimates have been made of the accumulated wealth of the United Kingdom and other countries, but it should be observed that these are largely conjectural, for the basis of estimation is necessarily vague in many particulars, and the margin of possible error therefore very great. For the United Kingdom the following estimates are available (the 1774 estimate relates to England and Wales only):—

Date of Estimate.	Millions of Pounds.	Authority.
1774	1,100	Young.
1812	2,200	Colquhoun.
1822	2,600	Lord Liverpool.
1840	4,100	Porter.
1865	6,100	Giffen.
1875	8,500	"
1885	10,000	"
1895	11,800	Mulhall.
1903	15,000	Giffen.
1903	11,400	Chiozza Money.
1908	13,700	"

All these estimates should be regarded in the same way as by their various authors—as attempts to solve a very difficult problem; they are at best approximations to the truth. The great variation in the 1903 estimates quoted above will show how wide is the margin of conjecture. Even more should caution be observed in comparing estimates of wealth made in different coun-

the western border of Durham, flows through the city of Durham, and empties into the North Sea at Sunderland, 65 m. from its source.

Weasel (*Mustela vulgaris*), a fierce carnivore, belonging to the same family as the stoat, polecat, and marten. It is from six to eight inches in length, the tail being from two to two and a half inches. The food consists of rats,

Country.	£
United Kingdom (Money, 1908)	13,700,000,000
France (Dictionary of Statistics, 1908) . .	9,000,000,000
German Empire (Ballod, 1908)	12,550,000,000
United States (Census Bureau, 1904) . .	22,340,000,000
Australia (Colquhoun, 1903)	982,000,000
New Zealand (Dictionary of Statistics, 1905)	270,000,000
India (Giffen, 1903)	600,000,000

tries. The following figures for the countries named are given upon the authorities and for the dates stated:—

These estimates should not be regarded as in any way comparable, for they have been formed on very different methods. The value of land plays a considerable part in them, and it should not be forgotten that the value of land varies largely with the price of food in a country, and the price of food may be altered by government action. The same consideration applies, only in different degree, to the various valuations of capital and commodities. References: *The New Dictionary of Statistics* (Webb), *Clark's Distribution of Wealth* (1899), *Chiozza Money's Riches and Poverty* (1910), and the various economic treatises of Adam Smith, Ricardo, Mill, Jevons, Sidgwick, Nicholson, Marshall, and others.

Wear, a river of England, which rises in the Pennines, on

mice, voles, shrews, as well as small birds, and even poultry, game-birds, and rabbits. The body is elongated and snakelike. The colour is mahogany brown above and white below. Occasionally weasels turn quite white in winter. The animal extends throughout practically the whole of Europe, N. and Central Asia, and a large part of N. America. Four or five young are brought forth at a time, and there may be two or three litters in the year.

Weather. See METEOROLOGY.

Weatherboards, boards used to form the outsides of wooden buildings. If horizontal, they should overlap to keep out the rain; if vertical, they should be grooved and tongued.

Weatherford, tn., Texas, U.S.A., co. seat of Parker co., 27 m. w. of Fort Worth. It has flour mills, cotton and cotton-seed oil mills, foundries, and pottery works. Pop. (1910) 5,074.

Weather Forecast. The earliest forecasts of the weather

occur in the writings of Aristotle, Theophrastus, and Aratus; but it was not until the discovery of the barometer, in the 17th century, that any attempt was made to draw definite conclusions from physical data. The first proposal for the use of the telegraph in this connection was by Carl Kriegl of Prague in 1842, and in 1849 Professor Henry of America had inaugurated a system whereby a concise summary of the weather was telegraphed every morning by the operators of the various telegraph companies. The first weather maps actually published embraced the period from Aug. 8 to Oct. 11, 1851, and were shown day by day in the great exhibition of that year by the Electric Telegraph Company. The first government to collect data by telegraph was Holland in 1855, France following in the same year; while England came third in 1860, the earliest daily weather report issued by the Meteorological Office appearing in the *Times* of Sept. 5. In August 1861 Admiral Fitzroy began to issue forecasts of coming weather. Most countries have now a central office, to which a large number of stations scattered over the country send information by telegraph of the height of the barometer and thermometer, the direction and force of the wind, and other particulars pertaining to the meteorological conditions prevailing at a given hour of the day. The data on arrival at the central office are charted on maps, and from these it is possible to issue forecasts of the coming weather.

In the United States, where the systems can be followed from their genesis in the Rocky Mts. until they pass away over the Atlantic, a high percentage of successful forecasts is attained; but in the British Is. and in France, which have no stations

to the west of them, weather prediction is extremely difficult. For the British Is. during the ten years 1890-9 the percentage of complete success varied from 46 per cent. in 1892 to 59 per cent. in 1893, the average for the ten years being 53.5 per cent. Since the beginning of 1909 radio-telegraphic reports have been received daily from Atlantic liners, and greater success in forecasting may now be anticipated. (See *Reports of the Meteorological Council* for year ending Mar. 31, 1900, and for 1909.) Forecasting is much more certain for the midland counties and the south of England than for the south of Ireland and the west of Scotland, owing to the rapidity with which weather changes take place in the latter districts. See R. H. Scott's *Weather Charts and Storm Warnings* (1887).

Weather-helm. A ship is said to carry weather-helm when she is inclined to come too near the wind, and therefore requires the helm to be continually put a little to leeward.

Weathering, the result of the changes, mechanical and chemical, produced by the action of the atmosphere on exposed rock surfaces. Alternate heat and cold expand and contract the minerals in the rocks, lessening their cohesion; moisture dissolves away the soluble minerals and enters into combination with others, producing hydrates, which are softer and less compact than the original substances; carbon dioxide (and in towns sulphuric, hydrochloric, and nitric acids) attacks many of the ingredients of rocks; frost breaks open the pores and crevices; wind carries away the fine debris, and uses it to wear down the exposed surfaces; lichens and mosses attach themselves, and facilitate disintegration and solution; marine animals bore into

the surface. Rocks composed largely of quartz, such as quartzites and pure sandstones, are very durable; cherts and flints are somewhat less so; granites and acid igneous rocks generally are very resistant to weathering, but their felspar and mica decompose and split up in course of time, especially in severe climates; slates weather very slowly, but clays and marls rapidly pulverize; limestones dissolve readily, and are the most soluble of all rocks; dolomite is distinctly more durable than limestone. Surfaces of fine marble were found to lose one-third of an inch in a century in Edinburgh; the best English dolomite in London lost one-eighth of an inch in fifty years; in St. Petersburg, polished faces of coarse granite retain their freshness only for a short time. Much depends on climate, prevailing winds, presence of chemical works or furnaces, and amount of moisture. The south-west side of buildings in London weathers twice as rapidly as the north-east.

Weather-side denotes that side of a ship which is towards the wind.

Weaver, riv. of England, in Cheshire, rises near the Shropshire border, and flows N.E. and then N.W. to the Mersey, 3 m. below Runcorn. Length, 45 m.

Weaver, JOHN (1673 - 1760), English dancing master, was born at Shrewsbury. From 1702 he was closely connected with theatrical enterprises in London; and he introduced (1702) entertainments called 'scenical dancing,' where the representation and story were carried on by dancing action and motion only. His best-known pieces, produced at Drury Lane and elsewhere, included *The Tavern Bilkers* (1702); *The Union* (performed at court on the Queen's birthday, 1707); *The Loves of Mars and*

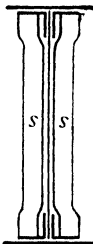
Venus and Perseus and Andromeda (1716); *Cupid and Bacchus* (1719); and *The Judgment of Paris* (1733). He also wrote *Lectures on Dancing* (1721), and an interesting work, *The History of the Mimes and Pantomimes* (1728).

Weaver-birds (Ploceidæ), a family of finch-like passerine birds, most abundantly represented in Africa, but also found in south-eastern Asia and in the Australian region. The bill is strong and conical, and there are ten primary quills in the wing. The most notable peculiarity, however, is the nest, which is a large, rough mass of grass, typically retort-shaped, with a tubular entrance or spout, which is made by weaving the blades of grass in and out just as in weaving cloth. Both sexes take part in the weaving process. Some of the weavers nest in colonies: *Philetarus socius* constructs an enormous umbrella-shaped mass of grass in a tree, each pair having its own cavity beneath this roof which serves alike as a shelter and a nest. Weaver-birds are usually bright-coloured, and often used as cage birds. The diet consists chiefly of seeds, but insects are also taken. The more typical forms belong to the genus *Ploceus*, of which *P. baya* is the baya or weaver-bird of India and Ceylon, which constructs a flask-shaped nest. In Africa the members of the genus *Hyphantornis* are common, and *H. capensis* of S. Africa is often kept in captivity, when it becomes very tame. Less typical are the whydah or widow birds and their allies, which form a special sub-family. The whydah birds (*Vidua*) are exclusively African, and are characterized by the fact that the males in breeding plumage have the four median tail feathers greatly elongated. The colouring is striking, being usually black, set off with some

contrasting tint, such as white or orange yellow. The best-known species is *V. paradisea*, a common cage-bird. This bird is stated to be very helpless in the full nuptial plumage. Related are the Munias, of which *M. oryzivora* is the well-known Java sparrow, often kept in captivity. Another African form is the wax-bill (*Estrelida astrilda*), a favourite cage-bird, with a bright-red bill, which has a translucent, waxy appearance.

Weaving. See COTTON and WOOL TEXTILES.

Web, the thin plate connecting the upper and lower flanges of an iron beam or girder. It is assumed that the web takes up the whole of the shearing stress. If the beam be horizontal, this produces in the web tensile and compressive stresses at angles of 45° with the horizon. The compressive stress tends to produce buckling in the web, and in calculation, strips of the web from flange to flange, along lines at 45° to the horizon, are taken as long columns fixed at the ends, their least diameter being the



Web (girder).

thickness of the web. The stability of these is investigated in the usual way—say by Gordon's formula—and, if necessary, stiffeners, *s, s*, are introduced, which both shorten the lengths of the

columns and prevent side buckling. In an open girder the tension and compression stresses are taken up directly by sloping ties and struts of breadth sufficient to prevent side buckling. See BRIDGE.

Webb, SIR ASTON (1849), English architect, born in London, has designed many notable buildings, among them the Britannia Royal Naval College, Dartmouth, the architectural surroundings for the Victoria Memorial, and the French Protestant church, Soho; while with Mr. D. Ingress as a partner he supplied the designs for the Royal United Service Institution, the new Christ's Hospital, and Birmingham University. He was knighted in 1904. In 1905 he was royal gold medallist, Architecture, England, and in 1907 was presented with the gold medal of the American Institute of Architects.

Webb, MATTHEW (1848–83), known as Captain Webb, the Channel swimmer, was born at Dawley in Shropshire. He was in the mercantile marine until 1875, when he became a professional swimmer, making his first attempt, August 12, to swim the Channel, which ended in failure, but succeeding on the second attempt, August 24. To maintain a waning popularity, he undertook to swim the rapids and whirlpool of Niagara, and perished in the attempt.

Webb, SIDNEY (1859), English author, born in London, was a civil servant, but resigned his position on being elected to the London County Council (1891). Among his works are *Socialism in England* (1890); *The London Programme* (new ed. 1895); *Labour in the Longest Reign* (1897); with his wife, Beatrice Webb, *The History of Trade Unionism* (new ed. 1902); *Industrial Democracy* (new ed. 1902); *Problems of Modern Industry* (new ed. 1902); *The*

History of Liquor Licensing in England (1903); *London Education* (1904); *English Local Government* (1906-8); *The Break-up of the Poor Law* and *The Public Organisation of the Labour Market* (1909); *English Poor Law Policy*; *The State and the Doctor* (1910), and *The Prevention of Destitution* (1911). His wife (née Beatrice Potter) has collaborated with him in many of his works, and was a member of the recent Poor Law Commission and the inspirer of the Minority Report.

Webb City, city, Jasper co., Missouri, U.S.A., in a lead and zinc region, 64 m. w. of Springfield. Iron products are manufactured. Pop. (1910) 11,817.

Webbe, WILLIAM (fl. 1568-91), English critic of poetry; studied at St. John's College, Cambridge, where he became acquainted with Spenser and Gabriel Harvey; he afterward acted (1583-9) as tutor in the Grey family. In 1586 there appeared his *A Discourse of English Poetrie*, which shows him to have been intimately acquainted with contemporary English poets as well as poetry. As a critic he has great merit and soundness. His *Discourse* was reprinted in Professor Arber's series (1870).

Weber, ERNST HEINRICH (1795-1878), German physiologist, born at Wittenberg; was professor of physiology and anatomical science at Leipzig for sixty years (1818-78). His researches were specially directed towards determining the influence of the sensory nerves upon mental operations. 'Weber's Law' affirms that 'there will be the same sensible difference of intensity between two sensations, provided the relative intensities of the stimuli producing them remain the same.' His most notable book (in conjunction with his brother Wilhelm Eduard) was *Wellenlehre* (1825).

Weber, GEORG (1808-88), German historian, born at Bergzabern in the Palatinate; became superintendent of the burgher school at Heidelberg (1848-72). His works include *Geschichte der Kirchenreformation in Grossbritannien* (ed. 1856); *Lehrbuch der Weltgeschichte* (21st ed. 1900); *Allgemeine Weltgeschichte* (15 vols. 2nd ed. 1882-90); and *Zur Geschichte des Reformationszeitalters* (1874).

Weber, KARL MARIA FRIEDRICH ERNST VON (1786-1826), the founder of German romantic opera, and one of the most brilliant pianists of his day, was born at Eutin, near Lübeck. In 1803-4 he studied under the Abbé Vogler in Vienna, and in 1804-6 held the appointment of conductor of the theatre in Breslau. After leaving Breslau he became for some time musical director to Duke Eugene of Würtemberg, and in 1807-10 acted as private secretary at Stuttgart to Duke Ludwig, brother to the king of Würtemberg. From 1813-16 he was director of the opera in Prague, and in 1817 became musical director of the German opera in Dresden, an appointment he held till his death. He died in London, whither he had gone to direct the production of *Oberon*, the opera commissioned by Charles Kemble. Weber's best known dramatic works are *Der Freischütz* (1820), *Euryanthe* (1823), *Oberon* (1826), and the music to the play of *Preciosa* (1820). See Dr. Spitta's article in Grove's *Dictionary of Music*; Sir Julius Benedict's *Weber*, in the Great Musicians Series (1881); Jähn's *Carl Maria von Weber* (1871); and A. Jullien's *C. M. Weber* (1894).

Weber, WILHELM EDUARD (1804-91), German physicist, younger brother of E. H. Weber, was born at Wittenberg, and appointed professor of physics at Halle (1828), and at Göttingen

(1831), but was deposed six years later for protesting against the political action of the Prussian government. Thereafter he devoted himself to researches in acoustics, magnetism, elasticity, and electro-dynamics, mostly in association with Gauss. He published *Elektrodynamische Massbestimmungen* (7 parts, 1846-77), and, in conjunction with his brother Eduard Friedrich (1806-71), *Mechanik der Menschlichen Werkzeuge* (1836).

Webster. (1.) Tn., Worcester co., Massachusetts, U.S.A., 16 m. s.s.w. of Worcester; has manufactures of cotton and woollen goods and shoes. Pop. (1910) 11,509. (2.) Tn., Iowa, U.S.A., co. seat of Hamilton co., 20 m. E. of Fort Dodge. It has railway repairing shops, and manufactures of foundry products and flour. Pop. (1910) 5,208.

Webster, AUGUSTA (1837-94), English poetess, was born at Poole, Dorsetshire. In 1863 she became the wife of Thomas Webster, a fellow of Trinity College, Cambridge. She published *Dramatic Studies* (1866); *A Woman Sold, and other Poems* (1867); *Portraits* (1870); *Disguises* (1879); *A Book of Rhyme* (1881); the drama, *The Auspicious Day* (1872); and the tragedy, *The Sentence* (1887). She was also the author of excellent verso translations of *Prometheus Bound* (1866), and *Medea* (1868). See Buxton Forman's *Our Living Poets* (1871), and Miles's *Poets and Poetry of the Century* (ed. 1905).

Webster, BENJAMIN NOTTINGHAM (1797-1882), English actor and play writer, was born in Bath, Somerset. He was essentially a 'character' actor, grim and serious rather than humorous being the parts which suited him—e.g. Rodin in *The Wandering Jew*, Jabez Sneed in *A Wife's Secret*, and Triplet in

Masks and Faces. He was for many years manager of the Adelphi Theatre, London, and later of the Haymarket, and wrote more than a hundred plays and farces, of which many were adaptations from the French.

Webster, DANIEL (1782-1852), American lawyer and statesman, distinguished for his acumen and oratory, was born at Salisbury, New Hampshire, of Scottish blood. He was called to the bar at Boston in 1805, and in 1813 represented New Hampshire in Congress as a Federalist. In 1816 he went to Massachusetts, where he laid the foundation of his reputation by his conduct of the Dartmouth College case. His high reputation as an orator was gained by a great speech at Plymouth, on the two hundredth anniversary of the landing of the Pilgrim Fathers. Henceforth, on every national occasion, Daniel Webster was brought to the front, although his efforts were for expediency. He desired peace above all things, and that the vested interests of the country should be respected. At one time he advocated 'unrestricted trade' against the protectionists. At another, his desire to prevent injury to the manufactures of his constituents prompted him to defend the tariff, or what was known as Clay's 'American system.' His greatest hit in the Senate was in 1827, when he attacked what was called 'nullification.' This was a Southern attempt to override Congress by allowing individual states to nullify or set aside any decree of the central government which they considered unconstitutional. Webster utterly confounded the promoters of this scheme. His *Speeches* were published in 6 vols. (1851). See *Lives* by G. T. Curtis (1869) and H. Cabot Lodge (1884).

Webster, JOHN (?1580-?1625), English dramatist, is one of the numerous Elizabethan playwrights of whose life we know next to nothing. In 1604 he made 'additions' to Marston's *Malcontent*. He collaborated with Dekker in the tragedy of *Sir Thomas Wyatt*, and the comedies, *Westward Ho!* and *Northward Ho!* (all published in 1607). His own unaided productions, on which his reputation as a dramatist rests, are four in number, namely, *The White Devil*, or *the Life and Death of Vittoria Corombona* (produced c. 1608-12), *Appius and Virginia* (produced c. 1609), *The Duchess of Malfi* (produced c. 1616), and the comedy, *The Devil's Law-case* (produced c. 1619). As a master of tragedy, and especially of the tragedy of terror and violence, he is ranked as second only to Shakespeare. This elevated position has been assigned to him, in virtue of the extraordinary power of some of his individual scenes, and the wonderfully vivid psychological and poetical touches which are constantly to be met with in his masterpieces, *The White Devil* and *The Duchess of Malfi*. *The Thracian Wonder* and *A Cure for a Cuckold*, fathered on Webster and Rowley in 1664, are probably not his. In 1624 Webster composed a city pageant; and the John Webster, cloth worker, who died in 1625, has been conjecturally identified with the poet. The chief editions of the works are those of Dyce (1830 and 1866), Hazlitt (1857-8), and a selection by J. A. Symonds in the *Mermaid Series* (1888). See also Hazlitt's *Lectures on the Literature of Elizabeth* (ed. 1901), Swinburne's essay in the *Nineteenth Century* of June 1886.

Webster, NOAH (1758-1843), American lexicographer, born

at West Hartford, Connecticut; was admitted to the bar in 1781, and in 1782 opened a classical school at Goshen, New York. Returning to Hartford (1789), he practised law for some years, but afterwards became editor of the New York *Minerva* and *Herald*. He was one of the founders of Amherst College. He wrote *A Brief History of Epidemics* (1799), and other works; but his fame rests on his *Compendious Dictionary of the English Language* (1828). The latest edition (1902) was enlarged under the supervision of Noah Porter. See *Life* by H. Scudder (1882).

Webster, SIR RICHARD EVERARD. See ALVERSTONE, LORD.

Webster Groves, tn., Missouri, U.S.A., in St. Louis co., 10 m. w.s.w. of St. Louis. Pop. (1910) 7,080.

Weckherlin, GEORG RUDOLF (1584-1653), German poet, born at Stuttgart; after acting as secretary to the Duke of Württemberg (1610-20), he went to England, and entered the service of James I. (1624), acting subsequently under Charles I. and Cromwell. He wrote epigrams, odes, sonnets, and rondeaux. A *Selection*, with biography, was published by Gödeke (1873).

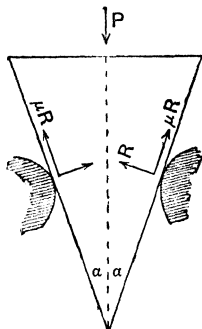
Wedderburn, ALEXANDER, LORD LOUGHBOROUGH and EARL OF ROSSLYN (1733-1805), lord chancellor of England, was born in Edinburgh, but was called to the English bar (1757). In 1762 he became a member of the House of Commons, acting with the opposition, which, however, he deserted to become Lord North's solicitor-general in 1771. In 1780 he was created Baron Loughborough. In 1784 he joined Fox; but in 1793 he was made lord chancellor by Pitt, whom in turn he deserted. He was created Earl of Rosslyn by Addington in 1801. See Campbell's *Lives of the Chancellors*.

Wedding Ceremonies. Formerly, a bridal was so named because of the warm, spiced 'bride-ale,' which the wedding party drank on returning from church. In the north of England, the custom still survives of the young men competing in a race for the ribbon or handkerchief which the bride bestows upon the winner, who thereafter presents it to his sweetheart. But the companion gift of the 'bride-spurs' has fallen into disuse. Brides'-knots, otherwise wedding-favours, are still in use; and so, too, is the bride's-cake, though it is no longer broken over the head of the bride, as was once the custom, the guests then making a scramble for the fragments. Nor is the drink, known as the 'bridal potion,' offered in these days to bride and bridegroom. Most, indeed, of the usages once followed are incompatible with the social ideas now current in civilized nations. The greatest variety of custom is found among the more primitive races. Burton states that in Somaliland the marriage ceremonies are conducted with feasting, music, and flogging—this last taking the shape of a sound horsewhipping administered by the bridegroom to the bride, 'with the view of taming any lurking propensity to shrewishness.' The marriage and divorce ceremonies of the gypsies are minutely described by Simson in his *History of the Gypsies* (1865). See also Wood's *The Wedding Day in all Ages and Countries* (1869), and Hutchinson's *Marriage Customs in Many Lands* (1897).

Wedel, vil. in Holstein, Prussia, near the Elbe, 12 m. w. by N. of Hamburg. Pop. (1910) 5,941.

Wedge, one of the so-called simple mechanical powers. If assumed symmetrical with regard to the angle of the wedge,

the reactions R being at right angles to the surfaces in contact, and $F = \mu R$ being the frictional forces opposing motion, the re-



Wedge.

lation between the effort P and the reaction R is got by resolving vertically. Hence $P = 2R \sin \alpha + 2\mu R \cos \alpha$, μ being the co-efficient of friction. The wedge is used to separate surfaces by introducing its edge between them, and then thrusting the wedge forward by blows of a hammer.

Wedgwood, JOSIAH (1730-95), English potter, was born at Burslem, in Staffordshire, where in 1759 he set up in business for himself. From the first he made experiments in the direction of securing a better material and a better craftsmanship, and in both directions he succeeded so well that he may be said to have created English pottery. He patented a cream-coloured porcelain, which from Queen Charlotte's appreciation of it became known as Queen's ware. One of the finest examples is the set he prepared for the Empress of Russia, every piece containing a transfer-printing of some English scene. The set was exhibited in London in the spring of 1910. He

early discovered how to make black pottery of great hardness and delicacy, and from this, which he called Basaltware, he advanced to the beautiful Jasper ware, his most famous achievement. The ground is blue, green, or brown, and on it appear cameo reliefs, generally of a classical design. The colour of the relief is usually white, but occasionally other colours are found. He employed sculptors like Flaxman and Tassie to prepare his designs, with the result that a multitude of urns, plaques, bowls, and medallions were issued which are highly prized by collectors. Wedgwood was one of the most enterprising manufacturers of his day; his catalogues were translated into more than a dozen foreign languages; and though he suffered all his life from bad health and died comparatively young, he left a fortune of nearly a million pounds. See Prof. Church's *Wedgwood* (1894), and Rathbone's magnificently illustrated monograph, *Old Wedgwood* (1893-8).

Wedmore, vil., Somersetshire, England, 8 m. W.N.W. of Wells. The name is frequently used instead of Chippenham for the treaty (concluded in 878 between King Alfred and Guthrum the Dane) by which England N. of Watling Street was ceded to the Danes.

Wedmore, SIR FREDERICK (1844), English art critic, born at Clifton. He has been art critic for the *Standard* since 1878; and among his works are *Studies in English Art* (1876-80), *Pastorals of France* (1877), *Meryon* (1879), *The Masters of Genre Painting* (1880), *Four Masters of Etching* (1883), *Life of Balzac* (1890), *Renunciations* (1893), *Etching in England* (1895), *Fine Prints* (1897), *Constable and Lucas* (1904), *Whistler and Others* (1904), *Some of the Moderns* (1909), and

Etchings (1911). He has also edited the English edition of Michel's *Rembrandt* (1894), and *Turner and Ruskin* (2 vols. 1900). He was knighted in 1912.

Wednesbury, munic. and par. bor., Staffordshire, England, 8 m. N.W. by W. of Birmingham. Iron manufactures are extensive (rails, axles, boiler plates, edge tools, gunlocks); there are also large potteries. Coal, ironstone, and limestone are mined in the vicinity. Pop. (1911) 28,108.

Wednesfield, urban dist., Staffordshire, England, forming a suburb of Wolverhampton; manufactures locks and keys, and has coal mines. Pop. (1911) 6,492.

Weedon Beck, par. and vil., Northamptonshire, England, on Watling Street, 4 m. S.E. of Daventry; has large military barracks, powder magazines, and stores. Pop. (1911) reg. dist. 4,142.

Weeds are wild plants growing in cultivated ground. In fighting with weeds, garden flowers will be much assisted by deep cultivation, rich soil, and a provision of those general conditions which conduce to their health and vigour. As a rule, it is the perennial weeds with spreading roots which give the real trouble. Every piece of such root—couch-grass, bindweed, etc.—should be picked out and burnt. For weedy paths, all that is required is to water them when dry with a solution made by boiling five ounces of powdered arsenic in a gallon of water, stirring the while, and then adding two gallons of cold water and half a pound of soda. On farms the seeding of weeds may be prevented by mowing when the first flower buds appear. In general, the following principles apply:—(1.) The rootstocks may be dug up and removed, a remedy that can be practically applied only in

small areas. (2.) Salt, mineral oil, or strong acid applied so as to come in contact with the freshly-cut roots or rootstocks destroys them for some distance from the point of contact. Crude sulphuric acid is probably the most effective of comparatively inexpensive materials that can be used for this purpose, but its strong corrosive properties render it dangerous to handle. Carbolic acid is less corrosive and nearly as effective. (3.) Rootstocks may be starved to death by preventing any development of green leaves or other parts above ground. This may be effected by persistent, thorough cultivation, by the use of the hoe or spud, and by salting the plants and turning on sheep in permanent pastures. (4.) The plants may usually be smothered by dense sod-forming grasses, or by a crop like clover or millet, that will exclude the light. (5.) Most rootstocks are readily destroyed by exposing them to the direct action of the sun during the summer drought, or to the direct action of the frost in winter. In this way ploughing becomes effective. (6.) Any cultivation which merely breaks up the rootstocks and leaves them in the ground, especially during wet weather, aids in their distribution and multiplication, and is worse than useless, unless the cultivation is continued so as to prevent any growth above ground. Spraying with a three per cent. solution of sulphate of copper, applied at the rate of 50 gallons per acre, has been found to kill charlock. Gas liquor, and a five per cent. solution of carbolic acid in water, were found effective by Dr. J. Voelcker in destroying wild garlic, red poppy, and other weeds; while applications of lime in the spring greatly reduced the amount of annual chrysanthemum. Spraying has found its strongest advocate in Mr. G. F.

Strawson. The most striking experiments upon the influence of certain established manures, such as superphosphate, potash salts, and nitrogenous manures, in gradually causing the disappearance of weeds in pastures, are to be found in Tipper's *Rothamsted Experiments* (1897), and Hall's *Rothamsted Experiments* (1905).

Weehawken, tnshp., Hudson co., New Jersey, U.S.A., adjoining Hoboken on the N., on the Hudson R., and connected with New York city by ferry. It is an important railway terminal, and is a residential place. Pop. (1910) 11,228.

Week. The period of seven days, now universally adopted over the Christian and Mohammedan worlds, is of Hebrew or Chaldean origin. It has been generally regarded as a memorial of the creation of the world, according to the Mosaic account, in that space of time. But it is, besides, the most obvious and convenient division of the lunar or natural month. Dion Cassius attributes the invention of the week to the Egyptians. The Ptolemaic arrangement of the heavenly bodies, according to their distances from the earth, is in this order—Saturn (the most distant), Jupiter, Mars, the Sun, Venus, Mercury, the Moon; and it was a principle of the ancient astrology that these bodies presided in this succession over the hours of the day. If the first hour be assigned to Saturn, the twenty-fifth, or first hour of the second day, will fall to the sun; the forty-ninth, or first hour of the third day, to the moon; and so on. From the Latin designations of the planets have been formed the modern names—Saturday (Saturn), Sunday (Sol), Monday (Moon), Tuesday (Tiu, the Saxon Mars), Wednesday (Woden, or Mercury), Thursday (Thor, or Jupiter), and

Friday (Frygga, or Venus). The week of seven days is not only a recognized space of time in the ancient Brahmanical astronomy, but the days are named in succession after the same heavenly bodies as among the Greeks and Romans. See CALENDAR.

Weem. See EARTH-HOUSE.

Weenen, vil., Natal, near Colenso and on the Tugela, notorious for the massacre here of Boer women and children by Dingaan, the Zulu king (1838). Pop. 1,600. Weenen county district has an area of 625 sq. m., and a pop. of about 28,000.

Weenix, JAN (1640-1719), Dutch painter, born at Amsterdam. His excellence as a painter of dead game secured him the patronage of Elector Palatine Johann Wilhelm. He was also a painter of landscapes and portraits. The *Dead Swan* at the Hague may perhaps be considered his masterpiece.

Weeping, an emotional disturbance characterized by short, deep inspirations, long expirations with the glottis narrowed, relaxed facial and jaw muscles, copious secretion of tears which are secreted by the lachrymal glands, and often by plaintive, inarticulate expressions. It is usually the involuntary result of strong emotion or of pain, but is sometimes a symptom of hysteria, in which affection it frequently alternates with laughter.

Weeping Tree, a term applied to a tree the branches of which droop towards the ground. Notable examples are afforded by the weeping willow, elm, and birch. Most of these trees cannot be propagated by means of seeds, but are increased by means of grafting, the graft being applied to a young tree of the upright-growing form.

Weert, comm., Netherlands, in Limburg prov., 59 m. E. of Antwerp. Pop. (1910) 10,090.

Weesp, comm., Netherlands, in N. Holland prov., 7 m. S.S.E. of Amsterdam. Pop. (1910) 7,077.

Weetslade, urban dist., Northumberland, England, 5 m. N. of Newcastle. Pop. (1910) 6,701.

Weever, or STING-FISH (*Trachinus*), a genus of bony fishes the members of which are everywhere dreaded on account of the painful wounds inflicted by their poison-bearing dorsal and opercular spines. Two species are British—the greater weever (*T. draco*), which reaches a foot in length; and the lesser weever (*T. vipera*), which is only about six inches in length. Both are coast fishes.

Weever, JOHN (1576-1632), English poet, critic, and antiquary, was born in Lancashire. In 1599 he issued *Epigrammes in the Oldest Cut and Newest Fashion*, in which there is a sonnet addressed to Shakespeare. In 1601 appeared *The Mirror of Martyrs*, in which he vindicates the character of Sir John Oldcastle from the suggestion that he was the original of Falstaff in Shakespeare's then recent play *Henry IV.*; and from this poem the date of Shakespeare's *Julius Cæsar* has been determined. Weever was an accomplished antiquarian, publishing (1631) *Ancient Funerall Monuments within the United Monarchie of Great Britaine and Ireland*.

Weevil, a general name for the members of the family Curculionidæ, or plant-eating beetles. Some twenty thousand species have already been described. The head is prolonged into a beak, which is very variable in length and thickness; and the antennæ are elbowed, the first joint being long. The larvæ are footless grubs; they are always vegetarian, and not infrequently cause great destruction. The adults usually do but little damage, but

the pine-weevil (*Hylobius abietis*) is an exception. The weevils of the genera *Apoderus*, *Attelabus*, and *Rhynchites* are interesting on account of the way in which the females roll up leaves in order to form a shelter for the young. Several species of leaf-rolling weevils occur in Britain, *Rhynchites betulae* being common on birch trees. The too familiar nut-weevil is the larva of *Balaninus nucum*, while *Sitones lineatus* is very destructive to pease. The nut-weevil lays her eggs in the young nut while it is still soft, and the grub remains until autumn within the shell, after which it bores a hole through and escapes. The species of *Anthrenomus* are very destructive to the flower-buds of fruit-trees. Thus *A. pomorum* attacks apple-blossom, feeding on the stamens and pistil so that the bud dies; the grub then pupates and the adult escapes, the whole life-history being rapidly run through. Grain is attacked by various weevils, notably by *Sitophilus granarius*, the corn-weevil, and *S. oryzae*, the rice-weevil. To the same sub-family belongs the large tropical palm-weevil (*Rhynchophorus palmarum*), whose fleshy grubs are sometimes eaten. Other important forms are *Apion apri-cans*, feeding on clover and other leguminous plants; species of *Bruchus*, which attack pease and beans; and *Scolytus destructor*, which belongs to a family closely allied to the weevils, whose members attack wood and bark.

Wehlau, tn., Prussia, prov. E. Prussia, at the junction of the Pregel and the Alle, 42 m. s.w. of Tilsit. The principal industries are iron-founding, tanning, and the manufacture of machinery. Pop. (1910) 5,301.

Wehrden, vil., Rhine Prov., Prussia, 7 m. w.n.w. of Saarbrücken. Pop. (1910) 5,405.

Wehrsdorf, vil., Saxony, Germany, 9 m. s. of Bautzen. Pop. (1910) 5,350.

Weida, tn., Saxe-Weimar, Germany, 18 m. w. by N. of Zwickau; manufactures woollens, boots and shoes, and wire goods. Pop. (1910) 9,300.

Weiden, tn., Bavaria, Germany, in the Upper Palatinate, 31 m. s.e. by E. of Bayreuth. It manufactures porcelain and machinery. Pop. (1910) 14,919.

Weidenau, vil., Westphalia, Prussia, in circle Siegen, 42 m. E. of Cologne. Pop. (1910) 9,363.

Weighing-machine. See BALANCE.

Weight. See HEIGHT AND WEIGHT TABLES.

Weights and Measures. All measurements consist of finding how often an unknown quantity contains some known quantity of the same kind. The abstract quantity, in terms of which the measurement is expressed, is called a 'unit'; while a 'standard' is its concrete representation. For example, the British unit of length is the yard, and the standard yard is the distance, at 62° F., between two plugs of gold sunk in a bar of platinum. This bar is preserved in London, while a number of more or less accurate copies are kept elsewhere. The French standard is similarly preserved in Paris, its length, at 0° C., defining the metre. Units are of two kinds—simple or derived. The yard, for instance, is a simple unit; and the square yard, being obtained from the first, is called a derived standard. The statement of how a derived unit involves the simple units is called its dimensions. Up till comparatively recent times common objects served as standards—the digit, the foot, the cubit, etc. Indeed in 1101 Henry 1. commanded that the length of his arm should define the yard; while in 1266 it was enacted

'that an English penny called a sterling, round and without clipping, shall weigh thirty-two wheat corns, from the midst of the ear.' The British units now in use are: the yard, as unit of length; the pound troy, as unit of weight; the gallon, as unit of capacity. The first of these may be determined from the length of the seconds pendulum, which in the latitude of London is 39.13929 in.; the second from a cubic inch of distilled water, which weighs 252.458 grains. The third is the space occupied by 10 lbs. avoirdupois (i.e. 7,000 grains troy) of distilled water. In the above operations the temperature is to be 62° F., and the barometer to stand at 30 in.

BRITISH SYSTEMS.

MONEY.

4 farthings = 1 penny (1d.).
12 pence = 1 shilling (1s.).
20 shillings (240d.) = 1 pound (£1).
(The value of the old Scots money was one-twelfth that of the sterling value—bottle = ½d., plack = ¼d., shilling = 1d., pound = 1s. 8d.)

The standard for gold coins is 22 carats—i.e. any weight of standard gold should contain 22 parts of pure gold and 2 parts of alloy. The standard for silver coins is 11 oz. 2 dwt. of pure metal and 18 dwt. of alloy, making together 12 oz. or 1 lb. troy. It is useful to remember that the diameter of the ½d. is 1 in.; and that three pence, five halfpence, ten farthings, five shillings, or ten sixpences, weigh 1 oz.

MEASURES OF LENGTH.

Common Linear Measure.

12 inches = 1 foot.
3 feet = 1 yard.
5½ yards = 1 pole, rod, or perch.
40 poles = 1 furlong.
8 furlongs = 1 mile.
1,760 yards = 1 mile.

The hand in terms of which horses are measured = 4 in. Gunter's chain of 66 ft. contains 100 links of 7.92 in. The military pace is 2.5 ft. The fathom of 6 ft. is used to record soundings. One cable's length = 120 fathoms, 240 yds. One Admiralty knot = 6,080 ft. One geographical mile = 6,082.66 ft.; one nautical mile = 1,870 yds. The earth's circumference is divided into 360 degrees of 69½ m. each.

MEASURES OF SURFACE.

144 square inches = 1 square foot.
9 square feet = 1 square yard.
30½ square yards = 1 square pole.
40 square poles = 1 rood.
4 roods. . . = 1 acre.
640 acres = 1 square mile.

The square chain being a tenth part of an acre, square links may readily be expressed in terms of acres, roods, and poles.

MEASURES OF CAPACITY.

1. *Solid or Cubic Measure.*

1,728 cubic inches = 1 cubic foot.
27 cubic feet = 1 cubic yard.

Forty cub. ft. of hard wood and 50 cub. ft. of other wood = 1 ton or load; 42 cub. ft. of wood = 1 shipping ton; 108 cub. ft. of wood = 1 stack of wood; 128 cub. ft. of wood = 1 cord of wood; 40 cub. ft. of merchandise = 1 shipping ton.

2. *Measure of Capacity.*

8 pints. = 1 gallon.
2 gallons = 1 peck.
4 pecks = 1 bushel.
8 bushels = 1 quarter.

Ten quarters = 2 weys = 1 last.
One gallon = 10 lbs. distilled water. United States bushel = 7688 bushel. Thirty-six bushels = 1 chaldron. The boll of meal = 140 lbs.

3. *Wine Measure.*

2 pints . . .	= 1 quart.
4 quarts . . .	= 1 gallon.
42 gallons . . .	= 1 tierce.
1½ tierces . . .	= 1 hogshead.
1½ hogsheads . . .	= 1 puncheon.
1½ puncheons . . .	= 1 pipe.
2 pipes . . .	= 1 tun.

4. *Ale and Beer Measure.*

4 gills . . .	= 1 pint.
2 pints . . .	= 1 quart.
4 quarts . . .	= 1 gallon.
9 gallons . . .	= 1 firkin.
2 firkins . . .	= 1 kilderkin.
2 kilderkins . . .	= 1 barrel.
1½ barrels . . .	= 1 hogshead.
1½ hogsheads . . .	= 1 puncheon.
1½ puncheons . . .	= 1 butt.

Of imported wines the following are the chief measurements: pipe of port=115 gals.; pipe of Marsala=93 gals.; pipe of Madeira=92 gals.; butt of sherry=108 gals.; aum of hock and Rhenish=30 gals.; hogshead of claret=46 gals. Imported spirits, brandy, and rum: puncheon=112 gals.; hogshead=56 gals.; quarter cask=28 gals.

WEIGHTS.

1. *Avoirdupois Weight.*

16 drachms	= 1 ounce.
16 ounces .	= 1 pound.
28 pounds .	= 1 quarter.
4 quarters	= 1 hundredweight
20 cwt. . . .	= 1 ton. [cwt.]
100 lbs.	= 1 cental.

2. *Troy Weight.*

24 grains . .	= 1 pennyweight.
20 pennyweight	= 1 ounce.
7,000 grains troy	= 1 lb. avoird.
5,700 grains	= 1 lb. troy.

3. *Apothecaries' Weight (prior to 1864).*

20 grains or minims	= 1 scruple.
3 scruples . . .	= 1 drachm.
8 drachms . . .	= 1 ounce.
12 ounces . . .	= 1 pound.

(Introduced in 1864.)

437½ grains . . .	= 1 ounce.
16 ounces . . .	= 1 lb.

4. *Apothecaries' Fluid Measure.*

60 minims .	= 1 drachm (¾ i).
8 drachms	= 1 ounce (¾ i).
20 ounces .	= 1 pint (O i).
8 pints .	= 1 gallon (C i).

Some useful approximations:—
A drop = 1 minim; a teaspoonful = 1 drachm; a dessert-spoonful = 2 drachms; a tablespoonful = 4 drachms; a wineglassful = 2 ounces; a teacupful = 6 ounces; a tumblerful = 8 ounces.

5. *Diamond and Pearl Weight.*

3·16831 grains	= 1 carat, 3·2 grs. troy.
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151½ carats = 1 ounce troy.

6. *Jewel Weight.*

240 grains (gold or silver)	= 1 carat.
24 carats	= 1 pound.

MEASURES OF TIME.

There are two systems in terms of which time is measured—the one for scientific, the other for practical purposes. In the former the sidereal day is the unit. It is the interval between two successive returns of the 'first point of Aries' to the meridian. This period is divided into twenty-four hours. In the latter the solar day is the unit, it being the interval between two successive returns to the meridian of an imaginary 'mean' sun moving on the equator with uniform velocity. Twenty-four hours mean solar time are equal to 24 hrs. 3 min. 56·554 sec. of sidereal time.

The divisions of the solar day are:—

60 seconds (sec.)	= 1 minute.
60 minutes . . .	= 1 hour.
24 hours . . .	= 1 day.

The day commencing at mid-night.

The solar year contains 365·24219 days. See CALENDAR.

MEASURES OF ANGLES.

The magnitude of an angle may be expressed in circular, centes-

imal, or sexagesimal measures. The first is used in scientific work, the last in practical. The radian, the unit of circular measure, is the angle subtended at the centre of a circle by an arc equal to the radius. Conversions from degrees to radians, and *vice versa*, are given by the equation $\frac{\theta^\circ}{360^\circ} = \frac{\theta}{2\pi}$, θ being the angle in radians, θ° in degrees.

The divisions of the right angle are:—

60 seconds (60'') = 1 minute (1').

60 minutes $\therefore$ = 1 degree (1°).

90 degrees . . . = 1 right angle.

The radian is equal to $57^{\circ}29'577$, etc., degrees. The centesimal method of dividing the right angle into grades, minutes, and seconds is sometimes used.

PAPER MEASURE.

24 sheets = 1 quire.

25 sheets = 1 quire
(printer's).

20 quires (480 sheets) = 1 ream.

21½ quires (516 sheets) = 1 ream
(printer's).

2 reams = 1 bundle.

10 reams = 1 bale.

METRIC SYSTEM.

See article under this title.

MEASUREMENT OF PHYSICAL QUANTITIES.

All physical quantities, such as force and velocity, can be expressed in terms of the length, mass, and time units.

C.G.S. SYSTEM.

In this the units are derived from the *centimetre*, fundamental unit of length; the *gram*, fundamental unit of mass; the *second*, fundamental unit of time. The units, being independent of any arbitrary quantities beyond the fundamental ones, are frequently said to be 'absolute.' The above is, however, the more appropriate name, since by tak-

ing the foot, pound, and second, another set of absolute units might be derived. Electric measurements are founded on the C.G.S. system. See UNITS.

WEIGHTS AND MEASURES OF OTHER COUNTRIES.

The metric system has been adopted by Austria, Belgium, Brazil, Bulgaria, the Central American states, Chile, Egypt, France, Germany, Greece, Italy, Mexico, Norway, Peru, Roumanin, Servia, Spain, Sweden, Switzerland, Turkey, Venezuela, and other countries. In Austria the names used under the metric system are the same as in Germany. In Belgium the system is used with the French names, excepting that the kilogram is called the *livre*, the *litre* is called the *litron*, and the *metre* the *aune*. In Germany the metric system is used, but with German names—*stab* for *metre*, *stuch* for *centimetre*, *kette* for *decametre*, *kanne* for *litre*, *schoppen* for *half-litre*, *fass* for *hectolitre*, *nealoth* for *decagram*. *Centner* = 50 kilograms. *Tonne* = 1,000 kilograms. In Greece, *pecheus* is used for *metre*, *gramme* for *millimetre*, *daktylos* for *centimetre*, *skionis* for *myriametre*, *stremma* for *are*, *litra* for *litre*, *kybos* for *millilitre*, *mystron* for *decilitre*, *koilon* for *hectolitre*, *drachma* for *gram*, *kokkos* for *centigram*, and *obolos* for *decigram*. The Italian metric names are *metro* for *metre*, *decametro* for *decametre*, *ettometro* for *hectometre*, *chilometro* for *kilometre*, *miriametro* for *miriametre*, *decimetro* for *decimetre*, *centimetro* for *centimetre*, *millimetro* for *millimetre*, *ara* for *are*, *ettara* for *hectare*, *centiara* for *centiare*, *litro* for *litre*, *decilitro* for *decalitre*, *ettolitro* for *hectolitre*, *chilolitro* for *kilolitre*, *decilitro* for *decilitre*, *gramma* for *gram*, *decagramma* for *decagram*.

SPECIAL WEIGHTS AND MEASURES.

Bag of coffee	112 to 180 lbs.
Bag of cocoa or sago	112 lbs.
Bag of sugar	224 lbs.
Bale of cotton, American	400 to 500 lbs.
Bale of cotton, Egyptian	700 to 740 lbs.
Bale of cotton, Indian	400 lbs.
Bar of gold (mint)	400 oz. troy.
Bar of silver (mint)	1,000 to 1,100 oz. troy.
Barrel of beef	200 lbs.
Barrel of butter	224 lbs.
Barrel of flour	196 and 228 lbs.
Barrel of gunpowder	100 lbs.
Barrel of raisins	112 lbs.
Barrel of soft soap	256 lbs.
Bolt of canvas	35 yds.
Bushel of barley	50 to 56 lbs.
Bushel of oats	38 to 42 lbs.
Bushel of wheat	62 to 63 lbs.
Cade of herrings	500 fish.
Chest of tea	80 to 84 lbs.
Cran of herrings	37½ gals.
Dicker of gloves	10 doz. pair.
Dicker of hides	10 skins.
Firkin of butter	56 lbs.
Firkin of soap	64 lbs.
Hank of silk	840 yds.
Hogshead of tobacco	12 to 18 cwt.
Last of fish (cod)	12 barrels.
Last of hides	12 doz.
Last of leather	200 skins.
Last of pitch or tar	14 barrels.
Last of wool	12 sacks.
(The last weighs about 4,000 lbs.)	
Load of bricks	500.
Load of earth or gravel	A cubic yard.
Load of hay or straw	36 trusses.
Load of lime	32 bushels.
Maze of herring	615 fish.
Pack of wool or flax	240 lbs.
Peck of flour	14 lbs.
Pig of ballast	56 lbs.
Pocket of hops	168 to 224 lbs.
Roll of parchment	60 skins.
Sack of flour	280 lbs.
Sack of wool	364 lbs.
Seam of glass	120 lbs.
Truss of hay (new)	60 lbs.
Truss of hay (old)	56 lbs.
Truss of straw	36 lbs.
Yard of butter	1 lb.

FOREIGN MONETIES.

Countries.	Monetary Unit.	Value in British Money.	Coins.
Argentina.....	Peso.	£ s. d. 0 4 0	Gold—argentine (19s. 10d.) and $\frac{1}{2}$ argentine; silver—peso and divisions.
Austria-Hungary.....	Crown.	0 0 10 $\frac{1}{2}$	Gold—20 crowns (16s. 8d.) and 10 crowns.
Belgium.....	Franc.	0 0 9	Gold—10 and 20 francs; silver—5 francs.
Brazil.....	Milreis.	0 2 3	Gold—5, 10, and 20 milreis; silver— $\frac{1}{2}$, 1, and 2 mil-reis.
British N. America (except Newfoundland).....	Dollar.	0 4 1 $\frac{1}{2}$	
British Honduras.....	Do.	0 4 1 $\frac{1}{2}$	
Chile.....	Peso.	0 3 9	Gold—escudo (7s. 6d.), doubloon (15s.), and condor (39s.); silver—peso and divisions.
Colombia.....	Dollar.	0 4 1 $\frac{1}{2}$	Gold—condor (49s.) and double condor; silver—peso.
Costa Rica.....	Colon.	0 1 11	Gold—2, 5, 10, and 20 colons (38s. 5d.); silver—5, 10, 25, and 50 centimos.
Cuba.....	Peso.	0 3 9	Gold—doubloon (20s. 8d.); silver—peso (2s. 6d.).
Denmark.....	Crown.	0 1 1 $\frac{1}{4}$	Gold—10 and 20 crowns.
Ecuador.....	Sucre.	0 2 1	Gold—10 sucres; silver—sucre and divisions.
Egypt.....	Pound (100 piastres).	1 0 3 $\frac{1}{4}$	Gold—10, 20, 50, and 100 piasters; silver, 1, 2, 10, and 20 piasters.
Finland.....	Mark.	0 0 9 $\frac{1}{4}$	Gold—10 and 20 marks.
France.....	Franc.	0 0 9 $\frac{1}{2}$	Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
Germany.....	Mark.	0 0 11 $\frac{1}{4}$	Gold—5, 10, and 20 marks.
Greece.....	Drachma.	0 0 9 $\frac{1}{4}$	Gold—5, 10, 20, 50, and 100 drachmas; silver—5 drachmas.

FOREIGN MONIES—Continued.

Countries.	Monetary Unit.	Value in British Money.		Coins.
		£	s. d.	
Haiti.....	Gourde.	0	4	0
India	Pound sterling a.	1	0	0
Italy.....	Lira.	0	0	9½
Japan.....	Yen.	0	2	1
Liberia	Dollar.	0	4	1½
Mexico.....	Peso.	0	2	1
Netherlands.....	Florin.	0	1	8
Newfoundland	Dollar.	0	4	2
Norway	Crown.	0	1	1½
Panama.....	Balboa.	0	4	1½
Peru.....	Libra.	1	0	0
Philippine Islands	Peso.	0	2	1
Portugal	Milreis.	0	4	5
Russia	Rouble.	0	2	1½
Spain	Peseta.	0	0	9½
Sweden	Crown.	0	1	1½
Switzerland	Franc.	0	0	9½
Turkey.....	Piaster.	0	0	2½
Uruguay.....	Peso.	0	4	3
Venezuela.....	Bolivar.	0	0	9½
				Silver—gourde.
				Gold—sovereign (pound sterling); silver—rupee (15 to the sovereign) and divisions.
				Gold—5, 10, 20, 50, and 100 lire; silver—5 lire.
				Gold—1, 2, 5, 10, and 20 yen.
				Gold—5 and 10 pesos; silver—peso and divisions.
				Gold—10 florins; silver, ½, 1, and 2½ florins.
				Gold—\$2 (\$2.02, 7).
				Gold—10 and 20 crowns.
				Gold—1, 2½, 5, 10, and 20 balboas; silver—peso and divisions.
				Gold—libra (20s.); silver—sol and divisions.
				Silver—peso, 50, 20, and 10 centavos.
				Gold—1, 2, 5, and 10 milreis.
				Gold—imperial (\$7.718) and ¼ imperial (\$3.859); silver—¼, ½, and 1 rouble.
				Gold—25 pesetas; silver—5 pesetas.
				Gold—10 and 20 crowns.
				Gold—5, 10, 20, 50, and 100 francs; silver—5 francs.
				Gold—25, 50, 100, 200, and 500 piasters.
				Gold—peso; silver—peso and divisions.
				Gold—5, 10, 20, 50, and 100 bolivars; silver—5 bolivars.

The currency fluctuates with the price of silver in Bolivia (boliviano, about 1s. 10d.), Central America (peso, about 1s. 10d.), China (tael, about 2s. 11d.; British dollar, or 'Mexican dollar,' about 2s.), and Persia (kran, about 4d.).

for decagram, miriagramma for myriagram, decigramma for decigram, centigramma for centigram, and milligramma for milligram.

In the Netherlands metric system *el* is used for metre, *streek* for millimetre, *duim* for centimetre, *palm* for decimetre, *roede* for decametre, *mijle* for kilometre, *kan* for litre, *vingerhoed* for centilitre, *maatje* for decilitre, *vat* for hectolitre, *wigtje* for gram, *korrel* for decigram, *lood* for decagram, *onze* for hectogram, and *pond* for kilogram.

In Spain the French metric names are formed by transforming the last letter into *o*—*e.g.* metro, litro, gramo.

In Turkey, metre becomes *arshin*, kilometre is *nal*, decalitre is *shinik*, hectolitre is *kileh*, are is *evlek*, hectare is *djeril*, kilogram is *oke*—*batman* meaning ten kilograms, *cantar* a hundred kilograms, and *tcheki* a thousand kilograms. See METRIC SYSTEM, and *supra*.

Burma.—The weights and measures are those of British India.

Canada.—The use of the metric system is legal, but British weights and measures are in extensive use.

China.—Tee (69 m.) = 250 li = 250 × 5 fun; yan (1,410 in. or 117.5 ft.) = 10 cheung = 10² chek = 10³ tsun = 10⁴ fun; king (16.485 ac.) = 10² mau. Picul or tan (133.333 lbs.) = 10² catties = 10² × 16 tael. Tau (1.1 gal.) = 10 shing = 10² koh. At Hong-kong British weights and measures are also used.

Ceylon.—The measures of length and surface are the British imperial measures. The measures of capacity are the *amomam* of 8 parabs, equal to 44.8 imperial gallons. The *parah* consists of 2 *mercals*, and a *merc* of 12 *seers*, the *seer* being equal to 1.86 of a British imperial pint. A *garce* = 25 *amomams*.

India.—The weights vary in value. Bengal—Kilogramme and litre introduced, but old measures are still employed. Jojun (8,000 yds.) = 4 *coss*; guz (1 yd.) = 2 *hath* = 2 × 6 *moot* = 12 × 4 *ungulee*. Maund (*bazaar* = 82.137 lbs.; *factory* = 74.667 lbs.) = 40 *seers* = 40 × 16 *chittacks*. Bombay—Guz (27 in.) = 24 *tussoo*; *beegah* (3,927 yds.²) = 20 *pund*. Candy (558 lbs.) = 20 *maunds* = 20 × 4 *seers* = 80 × 72 *tanks*. Madras—Cawnic (1.322 ac.) = 24 *mannee*; maund (24.686 lbs.) = 8 *viss* = 8 × 40 *pollums* = 320 × 3 *tolas*; *merc* (3 gals.) = 8 *puddees*.

Japan.—Measure—ken (6 shaku or 60 sun) = 6 ft.; cho (60 ken) = 119.3 yds.; ri = 2½ m.; square cho = 2½ ac. Weight—kin = 160 *monme* = 1½ lbs.; tan (100 kin) = 133½ lbs. Capacity—To (10 sho) = 3.703 gals.; koku (10 to) = 4.96 bushels.

Malta.—The British imperial weights and measures are the only legal weights and measures in use in Malta.

Persia.—Measures of length—*zer* or *guz* is the chief unit, varying in length from 25 to a little over 44 British imperial in., its normal length supposed to be about 36.465 in., but often reckoned at 40. The measures of capacity are the *chenica*, about 2.3 pints; the *collothun*, about 1.8 gal.; the *capicha*, 2 *chenica*; and the *artata*, 8 *collothun*. The weights are—*miscal*, 71 grains; *abassi*, 8 *miscals*; *seer*, 16 *miscals*.

Russia.—Measures of length—8 *vershoks* = 1 *stopa* (14 inches); 2 *stopas* = 1 *arschine*; 3 *arschines* = 1 *saschine*; 500 *saschines* = 1 *verst* (5½ furlongs). Measures of surface—9 sq. *arschines* = 1 sq. *saschine* (784 sq. in.); 2,400 sq. *sachines* = 1 *desatine* (13,066½ sq. yds.). The *desatine* is equal to 2 ac. 2 *roods*. Weights—2 *zolotnicks* = 1 *lotti* (8 dwt. 5½ grs. troy); 8 *zolotnicks* = 1 *lana* (1½ oz. avoird.); 96 *zolotnicks* = 1 *funt*

(14½ oz. avoird.); 40 funts = 1 pood (1 qr. 8½ lbs.); 10 poods = 1 berkowitz (3 cwt. 0 qrs. 25½ lbs.); and 3 berkowitz = 1 packen (9 cwt. 2 qrs. 19½ lbs.).

Siam.—Kub = 10 in.; sok = 20 in.; wa = 80 in.; roeneng = 2,000 wa (about 2½ British miles). Thonon = about 1½ imperial pints; thong = 3.75 gals.; coyan = 375 gals. Bat or tical = 234.06 grains; tael = 4 ticals; chang = 20 taels (2.675 of British imperial pounds); pical = 50 chang (133.75 British imperial pounds).

United States.—Weights and measures as in Great Britain, but the old Winchester measures are used, which are as follows:—Dry—pint = .969 pint; gallon = .969 gal.; bushel = .969 bush.; quarter = .969 qr. Liquid—pint (beer) = 1.017 pint; pint (wine and spirit) = .833 pint; gallon (wine and spirit) = .833 gal.

See Buchanan's *Tables of Weights and Measures* (1838); J. Brandis's *Das Münz-, Mass-, und Gewichts-wesen* (1866); H. W. Chisholm's *Weighing and Measuring* (1873), and *Report on the Exchequer Standards* (1877); H. Dourother's *Dictionnaire Universel des Poids et Mesures, Anciens et Modernes*; Kelly's *Metrology* (1816) and *Universal Cambist* (ed. 1835); J. H. Norman's *The Universal Cambist* (1897); Browne's *Money, Weights, and Measures of all Nations* (8th ed. 1899); M. S. Soutzo's *Etalons Ponderaux Primitifs* (1884); Hallock and Wade's *Outlines of the Evolution of Weights and Measures and the Metric System* (1906).

Law of Weights and Measures.

—The previous law was consolidated by the Weights and Measures Act of 1878, amended by the Acts of 1889, 1892, 1893, and 1897. The administration of the law is vested, in counties and in boroughs which have not a separate court of quarter sessions and have not elected to administer the

act, in county councils; in the larger boroughs, in town councils; in London, except in the City of London, in the county council; and the inspectors of these bodies verify the accuracy of weights and measures used in trade. The use in trade of unauthorized or unjust weights is punishable by a fine of £5, and £10 for a second offence (£20 in case of unjust weights). Under the Act of 1897 metric Board of Trade standards have been legalized. Bread must be sold by weight, except French or fancy bread or rolls. Coal must be sold by weight, except when by written consent of the purchaser it is sold by boat-load or by wagons or tubs.

Wei-hai-wei, British naval and coaling station, on N.E. coast of Shang-tung peninsula, China, 40 m. E. of Chifu; commands the s. entrance to the Gulf of Pe-chi-li. Besides the harbour and the island of Liukung-tao forming it, the British leased in 1898 a strip of land 10 m. wide round the bay, and covering an area of 285 sq. m., though British military rights extend over an area of 1,500 sq. m. The chief exports are ground-nuts and ground-nut seeds. During 1910, 529 steamers, of a total net tonnage of 450,000 tons, called at Wei-hai-wei. Its excellent climate makes it a summer resort for Europeans. Pop. (1911) 147,133, including 215 Europeans. See R. F. Johnston's *Lion and Dragon in Northern China* (1910).

Wei-ho, riv., China, flows E. through the prov. of Kan-su and Shen-si, and joins the Hoang-ho above Tungkwan.

Weil, GUSTAV (1808-89), German Orientalist, born of Jewish parents at Sulzburg; was appointed librarian at Heidelberg (1838-61), and professor of Oriental languages in that university (1861-89). Among his works are

Biblische Legenden der Muselmänner (1845; Eng. trans. 1846); *Geschichte der Chalifen* (1846-51); *Mohammed der Prophet* (1843); and *Die Poetische Litteratur der Araber* (1837).

Weilkeim, tn., Bavaria, Germany, 30 m. s.w. of Munich. Pop. (1910) 5,246.

Weimar, tn., cap. of grand-duchy of Saxe-Weimar, Germany, 12 m. E. of Erfurt; is a seat of the book trade, and has manufactures of cloth and leather. In the 18th and 19th centuries it was a great literary and musical centre, having associated with it Goethe, Schiller, Herder, Wieland, Immermann, Liszt, Richard Strauss, and others, and is sometimes called the 'German Athens.' Among the numerous buildings are the ducal palace, the 15th-century town church, containing Cranach's *Crucifixion*, and the Liszt Museum. Pop. (1910) 34,581. See Francke's *Weimar und Umgebung* (3rd ed. 1900).

Weinberge, or KÖNIGLICHE WEINBERGE, tn., Bohemia, Austria, an eastern suburb of Prague. Pop. (1911) 77,093.

Weinböhla, vil., Saxony, Germany, 9 m. N.W. of Dresden. Pop. (1911) 6,284.

Weingarten, tn., Würtemberg, Germany, 42 m. s.s.w. of Ulm. The abbey church contains one of the finest organs in the country. Pop. (1910) 8,077.

Weinheim, tn., Baden, Germany, 10 m. E.N.E. of Mannheim. It has tanneries, and manufactures machinery. Pop. (1910) 14,159.

Weinsberg, tn., Würtemberg, Germany, 26 m. N. by E. of Stuttgart. Towering above the town are the ruins of the Castle Weibertreu (woman's fidelity), famous in legend. Pop. (1910) 3,271.

Weipert, tn., Austria, in Bohemia, on Erzgebirge, at alt. of 2,380 ft., 20 m. w. of Komotau; manufactures laces and haberdashery. Pop. (1911) 11,834.

Weir. See RESERVOIRS.

Weir, HARRISON WILLIAM (1824-1906), English artist, author, and journalist, was born at Lewes. He became an expert animal painter and draughtsman, his first picture being *The Dead Shot*, exhibited at the British Institution (1843). Among his best works are *Startled*, *The Forester*, *A Servant of All Work*, and *The Christmas Carol*. He illustrated over 130 books, including *Routledge's Natural History*. He also originated the first cat show at the Crystal Palace, and wrote and illustrated *Our Cats and all about Them* (1889), as well as *Poultry and all about Them*.

Weir-Mitchell Treatment. In the treatment inaugurated by Dr. Weir Mitchell the chief feature is rest, with forced feeding. The patient should be kept in bed, and should be isolated from friends. In place of exercise is substituted massage, which stimulates the circulation and increases the appetite without producing exhaustion. Of the many disorders which are benefited by this treatment neurasthenia and hysteria perhaps occupy the front rank.

Weisenau, vil., Hesse, Germany, forming a suburb of Mainz. Pop. (1910) 6,468.

Weishaupt, ADAM (1748-1830), born at Ingolstadt, where he was made (1772-85) professor of natural and canon law with the aid of the Jesuits, whose pronounced enemy he afterwards became. He founded the Illuminati, admitting into the order men of every creed; but the order was interdicted by the Bavarian government (1785). He wrote a number of philosophical works.

Weismann, AUGUST (1834), German biologist, born at Frankfurt-on-Main; was (1861-2) physician to the Archduke Stephen of Austria; studied zoology under Leuckart at Giessen; in 1866 was appointed professor of zoology at

Freiburg. His early researches were devoted to pure zoology; but the partial failure of his eyesight forced him to give up microscopic work, and he turned his attention to problems of evolution. Weismann's theory of the continuity of the germ-plasm, which is discussed under HEREDITY and EMBRYOLOGY, is tantamount to a statement of an entire scepticism in regard to the inheritance of acquired characters. His more important works have been translated into English—e.g. *Studies in the Theory of Descent* (1882), *Essays upon Heredity* (1889-92), *The Germ-plasm* (1893), and *The Evolution Theory* (1904). His most recent books are *Charles Darwin u. sein Lebenswerk* (1909), and *Die Selections Theorie* (1909).

Weiss, BERNHARD (1827), German theologian, born at Königsberg. He was professor of theology at Kiel in 1857, and at Berlin in 1877. His *Lehrbuch der Biblischen Theologie des Neuen Testaments* (1868) has passed through five editions, and has been translated into English (1882-3); also his *Lehrbuch der Einleitung in das Neue Testament* (1887; Eng. trans. 1887-8), and *Das Leben Jesu* (1882; Eng. trans. 3 vols. 1883-4). He contributed largely to Meyer's *Kritisch-exegetischer Kommentar über das Neue Testament* (1883-8).

Weissenburg (Fr. *Wissenbourg*). (1.) Town, Alsace-Lorraine, Germany, 33 m. N. by E. of Strassburg; has manufactures of leather, beer, paper, and matches. On August 4, 1870, the Germans, under the Crown Prince of Prussia, defeated the French here, their first victory in the war. The Benedictine abbey, founded here in the 7th cent., was the seat of a famous school. Pop. (1910) 6,772. (2.) Town, Bavaria, Germany, in Middle Franconia, 12 m. E. by N. of Nördlingen. It is a busy industrial town, and has some

interesting mediæval buildings. Pop. (1910) 7,190.

Weissenfels, tn., prov. Saxony, Prussia, on the Saale, 20 m. s. of Halle; has manufactures of machinery, boots, and paper. Coal is mined. Pop. (1910) 33,586.

Weissensee, vil., Prussia, 2 m. N.E. of the city of Berlin, with which it is connected by street railway. Pop. (1910) 43,031.

Weisshorn. This wonderfully symmetrical pyramidal peak (14,804 ft.) is by many considered the most magnificent of the Alps. It rises w. of the Zermatt valley, and was first conquered in 1861 by Professor Tyndall.

Weisskirchen. (1.) Town, Hungary, in co. of Temes, 55 m. s. by E. of Temesvar; is noted for its wine. Pop. 11,000. (2.) Or MÄHRISCH WEISSKIRCHEN, tn. of Austria, in Moravia, 25 m. E. by S. of Olmütz. Pop. (1911) 8,732.

Weissstein, vil., Silesia, Prussia, 43 m. S.W. by W. of Breslau. Pop. (1910) 11,119.

Weisswasser, vil., Silesia, Prussia, 45 m. N.E. of Dresden. Pop. (1910) 11,807.

Weitbrecht, GOTTLÖB FRIEDRICH (1840), German theologian, born at Kalw; devoted himself to teaching till his appointment as a clergyman in Stuttgart. His principal works are *Leben Jesu* (3rd ed. 1896), simple and direct, and popular theological and edificatory treatises.

Weitmar, comm., Westphalia, Prussia, 8 m. E. by S. of Essen. Pop. (1910) 21,955.

Weizsäcker, JULIUS (1828-89), German historian, was born at Oehringen. He was professor at Erlangen (1864), at Tübingen (1867), Strassburg (1872), Göttingen (1876), and Berlin (1881). He was editor of the *Deutsche Reichstagsakten* (1867-77).

Weizsäcker, KARL (1822-99), German theologian, brother of the above, also born at Oehringen, near Heilbronn. He succeeded

Baur as professor of theology at Tübingen in 1861, and became known as editor of the *Jahrbücher für Deutsche Theologie* (1856-78), and by his *Untersuchungen über die Evangelische Geschichte* (1864) and *Das apostolische Zeitalter* (1886; Eng. trans. 1894).

Wekerle, ALEXANDER (1847), Hungarian statesman, was born in the co. of Stuhlweissenburg. He was for a while professor of financial science at the University of Budapest. In 1889 he was appointed minister of finance. In 1892 he succeeded Count Szapary as premier, and in 1894 was successful in passing the Civil Marriage Bill. He was, however, defeated by the Clericals in 1895, and retired. He was president of the Hungarian Court of Administration from 1897 to 1906.

Welbeck Abbey, seat of Duke of Portland, Notts, England, 4 m. s.w. of Worksop. The 17th-century mansion incorporates portions of an abbey founded in the time of Henry II.

Welch, or WELSH, JOHN (?1570-1622), Scottish reformer and divine, was born in Dumfriesshire, and was appointed minister at Selkirk (1590), Kirkeudbright (1594), and visitor for Annandale (1596). In 1596 he publicly preached against the king and the council, and was denounced as a rebel, but was permitted to return to his charge (1597). For attending a prohibited assembly at Aberdeen he was convicted of high treason and sentenced to exile (1606). He resided in France till 1621, when he was allowed to return to Scotland.

Welcker, FRIEDRICH GOTTLIEB (1784-1868), German classical scholar, born at Grünberg in Hesse-Darmstadt; was private tutor in the house of W. von Humboldt in Rome (1808), and became professor of archæology (1809) at Giessen, at Göttingen

(1816), and at Bonn (1819). Among other works he wrote *Die Aeschyleische Trilogie* (1824-6); *Der Epische Cyklus oder die Homerischen Gedichte* (1835-49); *Griechische Götterlehre* (1857-63); and *Die Griechischen Tragödien* (1839-41). See Kekule's *Life*, in German (1880).

Weld. See WOOL. D.

Welding, the process of uniting materials by pressing or hammering them together when in a more or less plastic state. This plasticity is usually brought about by raising the temperature, as in the case of iron, platinum, or glass; but it may occur under the influence of pressure alone, as in the union of ice, or of metallic particles into a homogeneous mass. Welding at a temperature short of the melting-point cannot be carried out with those metals that pass sharply from the solid to the liquid state. In the welding of iron, the parts to be united are heated in a forge to a temperature short of whiteness. A little sand or borax is sprinkled on the surfaces to be joined, to render the scale of oxide fluid, and the parts are then hammered together. Mild and tool steels are more difficult to weld, particularly if required to be united to wrought iron, as they must be worked at a lower temperature. Borax and sal-ammoniac are used as fluxes in welding steels. For electric welding, see ELECTRO-METALLURGY.

Weldon, WALTER (1832-85), English chemist, was born at Loughborough, and in 1854 went up to London to journalism. Here in 1860 he commenced *Weldon's Register of Facts and Occurrences*. He turned his attention to technological chemistry, the lime-manganese (1869) and the magnesia-chlorine (1870) processes being his invention.

Weldon Mud, the mixture of manganites of calcium and

manganese obtained in Weldon's process for recovering manganese dioxide from the waste acid liquors of chlorine stills. The liquor, after neutralization with chalk, is treated with milk of lime, and the precipitate oxidized by blowing steam and air through it. The product is a dark semi-fluid sludge, of which the solid portion contains from 60 to 70 per cent. of manganese dioxide, on which account it is returned to the chlorine stills for use instead of the native manganese ore.

Welhaven, JOHAN SEBASTIAN CAMMERMEYER (1807 - 73), Norwegian author, born at Bergen. In 1830 he began a literary feud with his brilliant contemporary, Henrik Wergeland. The quarrel led to the founding, by Welhaven and his friends, of *Vidar* (1832-4), the first critico-literary journal in Norway. After a continental tour, Welhaven published his first collection of poems, *Digte* (1839). Of his later poetical works the most important are *Nyere Digte* (1845), *Halvhuendrede Digte* (1848), *En Digtsamling* (1859), all remarkable for deep feeling and a classical purity of style. Welhaven also contributed masterly criticisms of Holberg and Petter Dass to the *Nord Univ. Tidsskrift*, during 1854. His *Samlede Skrifter* were published in 1867-9.

Well. See WATER, ARTESIAN WELLS, BORING, SINKING, WATER SUPPLY.

Welland. (1.) River, England, rises in Northamptonshire, flows N.E. to the Wash, below Fosdyke Bridge. It is navigable to Spalding. Length, 70 m. (2.) Town, Ontario, Canada, co. Welland, 35 m. S.E. of Hamilton. Pop. 6,500. By means of the Welland Canal navigation is carried round the Niagara Falls and rapids; it was begun in 1824 and opened in 1829. It is now 26½ m. in length, and by means of

twenty-six locks rises 326½ ft. It is navigable by vessels drawing 14 ft. of water, and cost £4,847,650.

Welle, riv. of equatorial Africa, rises in the Mangbattu country, and flows W. through the N. of Belgian Congo as the Makua or Welle to Yakoma, where it is joined on the r. bk. by the Bangasso. The united streams then flow, as the Ubangi or Mobangi, between Belgian Congo and French Congo, W. and S. to join the Congo on the r. bk. S. of the equator. The river was explored by Schweinfurth in 1870, and by Stanley and Grenfell.

Wellesley, ARTHUR. See WELLINGTON, DUKE OF.

Wellesley, RICHARD COLLEY, MARQUIS (1760-1842), governor-general of India, was born in Dublin; the brother of the 'Iron Duke.' He supported Wilberforce's efforts to suppress slavery; was appointed in 1786 a lord of the Treasury; in 1798 nominated governor-general of India. In seven years of vigorous administration he secured results unparalleled in the annals of the East India Company, foiling the machinations of Tipu Sahib (sultan of Mysore), dissipating the dreams of French dominion in India, and doubling the revenue of the company, the directors of which awarded him an annuity of £5,000. He was also created (1799) Marquis Wellesley. In 1809 he was appointed British minister at Lisbon, and in 1821, and again in 1833, lord-lieutenant of Ireland.

Wellesley, tn., Massachusetts, U.S.A., in Norfolk co., 14 m. W.S.W. of Boston. It is the seat of Wellesley College for the education of women, which had 1,375 students in 1910, and is purely a residential town. Pop. (1910) 5,413.

Wellesley Province. See PROVINCE WELLESLEY.

Wellhausen, JULIUS (1844), German theologian and critic,

was born at Hameln. He studied at Göttingen under Ewald, and became professor of theology at Greifswald in 1872. In 1882 he resigned his professorship, not being able conscientiously to adhere to the accepted standard of orthodoxy. He then obtained (1885) the post of professor of philology at Halle, became professor of Oriental languages at Marburg in 1885, and is now professor of Oriental languages at Göttingen. He is a thorough-going critic on the lines of Graf and Kuenen. He has written *Prolegomena zur Geschichte Israels* (1878; 6th ed. 1905; Eng. trans. 1885); *Muhammed in Medina* (1882); *Die Komposition des Hexateuch* (1889; 3rd ed. 1898); *Israelitische und Jüdische Geschichte* (1894, 6th ed. 1907; and *Das Arabische Reich und sein Sturz* (1902); and ed. the first three gospels (1903-4) and the gospel of John (1908.)

Wellingborough, mrkt. tn., Northamptonshire, England, 10 m. N.E. of Northampton. It has boot and shoe industries and iron works. Smelting and brewing are also carried on. Pop. (1911) 19,758.

Wellington. (1.) Urb. dist., Shropshire, England, 10 m. E. of Shrewsbury, near the Roman Watling Street; manufactures agricultural implements and woodware. The Shropshire Union Canal affords communication with the Severn. Pop. (1911) 7,820. (2.) Market tn., Somersetshire, England, 7 m. S.W. of Taunton; has a fine town hall. On the Blackdown Hills (2½ m. S.) is the Wellington monument. Woollens are manufactured. Pop. (1911) 7,634. (3.) City, cap., and (since 1865) seat of government of New Zealand, at the southern extremity of North Island, on Lambton Harbour, Cook Strait. There is deep water close to the shore (Port Nicholson). The city is cramped for space. Among the chief public buildings

are Government House, Houses of Parliament, government buildings, and the Victoria College of the University of New Zealand. The chief industrial establishments are foundries, freezing works, woollen mills, soap and candle works, wax-match factory, pottery works, boot factories, and rope works. In 1909 the total trade was valued at £8,156,234. Pop. 50,000; or, including suburbs, 65,000. The provincial dist. of Wellington has an area of 11,000 sq. m. and a pop. of nearly 200,000. (4.) Town, Cape of Good Hope, 45 m. N.N.E. of Cape Town by rail, at the foot of the Drakenstein Mts. Has a wine and brandy industry, and wagon, leather, vinegar, jam, and fruit-drying factories. Auriferous rock occurs in the vicinity. Pop. 5,000. (5.) Town, Wellington co., New South Wales, on the Macquarie R., at its junction with the Bell R., 160 m. N.W. of Sydney. The district is highly auriferous, and fruit is largely grown. There are famous caves in the vicinity. Pop. (including township of Montefiore on the opposite bk. of the Macquarie) 3,900. (6.) Hill station and military cantonment in the Nilgiris dist., Madras, India, 5 m. S.E. of Utaikamand. It is the principal military sanatorium of Madras, and has an excellent climate. European fruits grow luxuriantly. Alt. 6,100 ft. (7.) Town, Kansas, U.S.A., co. seat of Sumner co., 30 m. S. by W. of Wichita. Flour-milling is the leading industry, and there are railway workshops. Pop. (1910) 7,034.

Wellington, ARTHUR WELLESLEY, FIRST DUKE OF WELLINGTON (1769-1852), was born (probably in Dublin) in the year of the birth of Napoleon. He learned the rudiments of war at the French academy in Angers. In 1793 he became intimate with Robert Stewart, afterwards Lord

Castlereagh, who had a marked influence on his career. He represented the pocket borough of Trim in the Irish Parliament. In 1787 he entered the army. In 1794 he covered, with great activity and skill, the retreat into Holland of the allies and of the Duke of York. He was sent to Calcutta in 1796. The military exploits of Wellesley were not at first brilliant—he failed at Seringapatam. But his powers shone out conspicuously on the day of Assaye (1803), where he exhibited for the first time in war his capacity in offensive tactics, and won a battle almost as decisive as that of Plassey. The great virtues of Wellesley, however, in India in these years were his sagacity, moderation, and integrity. He restrained the ambition of a somewhat headstrong brother; insisted on faith being kept with the Indian princes, and showed himself especially averse to unjust conquests; above all, he did much to purify and improve the Indian civil service.

Wellesley was at the bombardment of Copenhagen in 1807, and was chosen by Lord Cathcart to arrange the conditions of the surrender of the Danes. In that year he was chief secretary for Ireland, under the Duke of Richmond. His great career in the Peninsula began in 1808. (For details of the campaign see under PENINSULAR WAR.)

The conduct of Wellington in these long and arduous campaigns was a magnificent display of profound insight, of resolute constancy, of military capacity of the highest order, and of unusual powers of organization. He alone saw from the beginning the admirable facilities for a diversion by a maritime power afforded by the Spanish peninsula. Alone also he saw the capacity for defence of Portugal. He displayed unequalled mili-

tary nerve against troops and leaders whose very name made Europe tremble; and a very high degree of strategical and tactical genius, especially of the latter. The most striking examples of the former were the retreat upon Lisbon, and the two changes of base which enabled him to press the campaign into France. In the matter of tactics Wellington had devised a deliberate plan for countering the Napoleonic tactics (attack in column or mixed formation) which had swept Europe. To such attacks he opposed the old two-deep line, but not until the last moment, and with its flanks carefully protected and garnished for the first time with swarms of skirmishers, skilfully concealed. The triumph of the Peninsula was thus not so much a triumph of phlegm and coolness on the part of the commander-in-chief, though these qualities were displayed in a high degree, as a triumph of penetrating military genius and intellect, backed by those inflexible moral characteristics for which the 'Great Duke' became proverbial. His weakness lay in a certain want of inspiration, of that 'divine element' in war which Napoleon possessed; also in a certain bleakness of character which made him appear not only austere but unappreciative, and deprived him of the affection of the men he commanded.

For his triumphs in the Peninsular war Wellington was made a duke. It was his fortune, after Napoleon's return from Elba, to encounter that greatest of masters of war; his operations in Belgium are not, however, his real crown of fame. The armies of Wellington and Blücher, about 220,000 strong, formed the northern column of the invading hosts about to overrun and subdue France; but they were widely separated from the huge eastern column. Napoleon therefore resolved to

make a sudden spring on them, to enter Belgium, and, if possible, to defeat them in detail. (For the ensuing operations, see WATERLOO.)

By the consent of all the allied sovereigns, Wellington commanded the army of occupation in France; and in this delicate mission he gave signal proof of his prudence and his tact, and his power to secure discipline. He was subsequently employed in several great diplomatic trusts. But he was not a successful prime minister. He belonged to the oligarchy that had ruled Ireland; he knew few public men when he first entered office; he made mistakes which cannot be denied; the difficulties which beset him in 1830 were immense. But three principles governed his public conduct, and on the whole command the respect of history: he disliked the Whig and Radical parties, at this time rather a danger to the state; he always wished 'to see the king's government strong'; he had profound sympathy with the loyal Irish Protestant class. As a statesman Wellington far excelled Marlborough, though he does not stand in the same rank as Pitt and Peel; but for a quarter of a century he was a main pillar of the state. In the frenzy of reform in 1831-2 he became an object of popular wrath. But the nation soon returned to its right mind: it accepted the dictatorship conferred on him in 1834. For the rest, his wisdom, his moderation, his high sense of duty, his perfect integrity, won the heart of England. His *Dispatches* were edited by Gurwood (15 vols. 1858-72). See *Lives* by Maxwell (2nd ed. 1900), Hooper (1889), and Brialmont (1856); G. R. Gleig's *Personal Reminiscences of the Duke of Wellington* (1904); *Personal Reminiscences of the Duke of Wel-*

lington, by Francis, first Earl of Ellesmere (1903); W. O'Connor Morris's *Wellington, Soldier and Statesman* (1904); and Oman's *Peninsular War* (in progress).

Wellington College, Berkshire, England, incorporated 1853, was founded by public subscription in honour of the Duke of Wellington, for the education of the sons of deceased officers of the British army.

Wellingtonia, a name formerly given to the giant trees of California; it has been superseded by the generic name of Sequoia. See SEQUOIA.

Wells. (1.) Munic. bor. and mrkt. tn., Somersetshire, England, at the base of the Mendip Hills, 19 m. s.w. of Bath; has a very fine cathedral, and is the seat of an important theological college. The place took its name from the holy springs, where King Ina built a monastery in 704; St. Andrew's Well still exists in the bishop's palace gardens. The bishopric is joined with Bath. Pop. (1911) 4,655. See T. Scott Holmes's *Wells and Glastonbury* (1908). (2.) Urban dist. and seapt. tn., Norfolk, England, 23 m. N.E. of King's Lynn. Brewing, rope-making, and machine-making are the chief industries. There are oyster fisheries. Pop. (1911) 2,565.

Wells, SACKED. The reverence formerly paid to fountains and springs by most of the races of the Old World was only one of several manifestations of the worship of nature. In the mythology of Northern Europe the fountain of Urd is imagined as springing up at the roots of the world tree Yggdrasil. Among the Greeks and the Romans each river had its tutelary god or goddess. The nymphs were specially worshipped as the divinities presiding over hot springs. Offerings were made to the

spirits of these various fountains. During the middle ages both church and state enacted laws against this cult. Religious services, usually ending in revelry, were performed beside these wells, and pilgrimages were made to them. Some were specially known as 'wishing-wells,' it being supposed that a wish solemnly made when depositing an offering would be fulfilled within the year. At certain wells, known as 'cursing-wells,' the wish took the form of a prayer for the death or the injury of an enemy. St. Elian's Well in Denbighshire was a noted example of a cursing-well. 'Pin-wells,' where the customary offering was a crooked pin, were very common. Others had a 'rag-bush,' or a tree growing near, on which rags were fastened or nailed as a gift to the water-spirit. There is one of this kind at Loch Marce, the theme of some beautiful verses by Whittier. Many of these 'holy wells' possess genuine therapeutic properties, and this obviously formed the basis of the belief that all or most of the wells regarded as sacred were efficacious in curing mental and bodily disease.

Wells, CHARLES JEREMIAH (?1799-1879), English poet, was born in London, and until the age of thirty practised as a solicitor. He was a friend of Hazlitt and of Keats. In 1822 he published *Stories after Nature* (new ed. 1891), and followed this up in 1824 with the drama of *Joseph and his Brethren*. This lay unnoticed until Rossetti in 1863 drew attention to its excellence. Then Swinburne, in a famous article in the *Fortnightly* (1875), proclaimed him as 'a poet meant to take his place among the highest.' Wells continued to write plays and poems, but on his wife's death (1874) he burned his manuscripts. In 1840 he had

gone to live in Brittany, and subsequently removed to Mar-selles, where he died. See Buxton Forman in Miles's *Poets of the Century* (ed. 1905), and Theodore Watts-Dunton in *The Athenæum* (1876 and 1879).

Wells, HENRY TANWORTH (1828-1903), English artist, born in London. When not more than seventeen he exhibited *Master Arthur Prinsep* at the Royal Academy. He was elected A.R.A. in 1866, and in 1880 he exhibited *Victoria Regina*, which represents Queen Victoria receiving homage on the death of William IV. His largest picture, *The Queen and Her Judges*, is commemorative of the opening of the new law courts in London.

Wells, HERBERT GEORGE (1866), English novelist, was born at Bromley, Kent. He began life as a teacher (1883) and science master (1888). He was then a coach for London University examinations. His first article in the *Fortnightly Review* (1890) was on a metaphysical subject. He then wrote for the *Pall Mall Gazette*, joined the staff of the *Saturday Review*, and was also on the staff of *Nature*. His novels have won him a wide popularity. *The Time Machine* (1895) was a bold, semi-scientific romance; *The Invisible Man* (1897) showed great imagination; *The War of the Worlds* (1898) was a fascinating mixture of weird adventure and scientific knowledge. Among his later books are *The First Men in the Moon* (1901), *The Sea Lady* (1902), *The Food of the Gods* (1904), *Man-kind in the Making* (1903), *Kipps* (1905), *A Modern Utopia* (1905), *In the Days of the Comet* (1906), *The Future in America* (1906), *New Worlds for Old* (1908), *Tono Bungay* (1909), *Anne Veronica* (1909), *The History of Mr. Polly* (1910), *The New Machiavelli* (1910), and *The Country of the Blind* (1911).

Wells, SIR THOMAS SPENCER (1818-97), English surgeon, was born at St. Albans. After serving as a surgeon in the navy till 1848 he settled in London (1853), where he lectured on surgery. He acted as a military surgeon during the Crimean war. In 1858 he successfully performed the operation of ovariectomy, which became his recognized speciality as a surgeon.

Wellston. (1.) City, St. Louis co., Missouri, U.S.A., a western suburb of St. Louis. Pop. (1910) 7,312. (2.) Town, Ohio, U.S.A., in Jackson co., 65 m. S.S.E. of Columbus. The leading manufactures are cement and iron and steel. Coal and natural gas occur in the district. Pop. (1910) 6,875.

Wellsville. (1.) Town, Columbiana co., Ohio, U.S.A., on the Ohio, 38 m. W.N.W. of Pittsburg; has railway workshops, iron, steel, and terra-cotta works. Coal, natural gas, and oil occur in the vicinity. Pop. (1910) 7,769. (2.) Town, Allegany co., New York, U.S.A., 20 m. S.W. of Hornell. It manufactures boilers, furniture, lumber, flour, leather, and machinery. Petroleum is found. Pop. (1910) 5,663.

Wels, tn. of Upper Austria, on the Traun, 17 m. S.W. of Linz; has manufactures of paper, machinery, leather, and has also iron foundries. Pop. (1911) 15,479.

Welsbach, CARL FREIHERR AUER VON (1859), Viennese chemist, who invented (1885) the mantle of metallic oxides for use with the ordinary bunsen gas burner. The mantle becoming incandescent gives a strong white light. He has written several technical works on the scarce earths, etc. See INCANDESCENT LIGHT.

Welsh Onion (*Allium pistulosum*), a Siberian perennial plant, very hardy in the British climate. Its roots, instead of 'bulbing,' as does the common onion, are long and tapering, and its stems and

leaves are hollow. It is cultivated for its young growths, used to flavour salads in the spring.

Welshpool, munic. bor., Montgomeryshire, Wales, on the Severn, 7 m. N. of Montgomery; has trade in flannel, tweeds, woollen shawls, and agricultural produce. A mile S.W. is Powys Castle, containing a rich collection of works of art. Pop. (1911) 5,917.

Welsh Rabbit, a popular savoury, made of melted cheese, superimposed on a slice of toast. It is erroneously assumed by some to signify 'rare-bit,' and is so written occasionally. Kindred terms are 'Scotch woodcock,' 'Irish apricots,' 'Billingsgate pheasant,' 'Bombay duck,' 'Yarmouth capon.'

Welsh Terrier. The Welsh terrier is the careful evolution from a breed that was found in the rough state in the principality, and used for rabbiting and getting foxes out of rocks. Bangor and Carnarvon were the first towns to accord the breed special classes at shows, and the Welsh Terrier Club was formed to promote its welfare and define its characteristics and type. In appearance it is not unlike the Irish terrier, saving colour, and it is a most gamy-looking dog. It should weigh from 18 to 22 lbs. Points:—A wire-haired black-and-tan terrier; head flat, and wider at base than between eyes; stop well defined and eyes set rather wide; muzzle fairly long, with more punishing power than seen in the fox terrier; nose black; teeth perfectly level; ears small, V-shaped, and carried forward on the cheeks; neck rather long and clean; shoulders clean, strong, and sloping; ribs deep and well sprung; chest deep, but narrow; loins short and strong; thighs muscular; stifle fairly bent; hocks well let down; fore legs straight and well boned; pasterns firm;

feet round and catlike, with sound pads; coat dense, hard, straight, and wiry, and about two inches long; colour black and tan, or grizzle and tan; free from white or pencilling on toes.

Welwitsch, FRIEDRICH MARTIN JOSEF (1806-72), Austrian botanist, was born at Klagenfurt in Carinthia; entered the service of Portugal (1839), and had charge of the botanical gardens at Lisbon till 1853, then he set out on a botanical expedition to Portuguese West Africa, which occupied him seven years, and was memorable for the discovery of the *Welwitschia mirabilis*. In 1863 he came to London for further botanical investigation, leaving the service of Portugal in 1866.

Welwitschia, a genus of plants belonging to the order Gnetales. The only species is *W. mirabilis*, a remarkable S. African plant, with a hard, brown, obconical trunk, lying just along the ground, and giving rise to two flat, leathery, linear leaves, often over six feet in length. It bears cymes of small scarlet cones, within the scales of which the solitary flowers are contained.

Wem, urb. dist. and mrkt. tn., Shropshire, England, 10 m. N. of Shrewsbury, with town hall (1905) and public library. Flour milling and tanning are carried on. Pop. (1911) 2,273.

Wembley, urb. dist. and tn., Middlesex, England, 8 m. w.n.w. of St. Paul's, London. Pop. (1911) 10,697.

Wemyss, par. on Firth of Forth, Fifeshire, Scotland, including the villages of Buckhaven, Methil, Innerleven, West and East Wemyss. The principal industry of the district is coal-mining. Pop. (1911) 23,104.

Wemyss, EAST and WEST, two adjoining vils., Fifeshire, Scotland, 1½ m. s.w. of Buckhaven. West Wemyss has a

good harbour, from which much coal is exported. Pop. (1911) 6,213.

Wemyss and March, FRANCIS CHARTERIS, NINTH EARL OF (1818), British statesman, who, as Lord Elcho, acquired great popularity as a founder of the volunteer movement, of which he has all along been a strenuous supporter. He was member for E. Gloucestershire (1841), Haddingtonshire (1847-83), and a lord of the Treasury (1852-5). He has written frequently on military topics, and has published *The New War Office* (1899).

Wen, a term popularly applied to any protuberant superficial tumour. Such a tumour may be either fleshy or cystic. In the latter case it results from distension of a cutaneous gland after the occlusion of its duct. In the human body the sebaceous glands are most liable to become affected in this way. A cystic wen should be transfixed and opened by a free incision. The thickened membrane around it may then be grasped, and the whole tumour shelled out. Fleshy wens should be dissected out from the surrounding tissues.

Wenceslaus, or **WENZEL** (c. 908-935), patron saint of Bohemia; was converted to Christianity by his grandmother, Ludmilla. After ascending the throne of Bohemia, he was assassinated by his brother Boleslas because he attempted to make his people Christians. See Schuldes's *Der Heilige Wenzel* (1848).

Wenceslaus IV. (1361-1419), king of Bohemia and emperor of Germany, son of the Emperor Charles IV., succeeded to the Bohemian crown in the third year of his age, and to the empire in 1378. A weak yet at times tyrannical and somewhat fickle prince, he incurred the enmity of his nobles, and was by them seized and imprisoned

(1394 and 1400-2), and finally he abdicated in favour of his brother Sigismund (1411). See *Life*, in German, by Pelzel (1788-90).

Wen-chow, city and treaty port, prov. Che-kiang, China, on riv. Wu, about 20 m. from its mouth. Formerly the centre of Japanese trade with China, its total trade in 1909 had declined to a value of only £289,316. Its chief exports are tea, timber, and paper umbrellas. Pop. 80,000.

Wenden, tn. in Livonia, Russia, on the Aa, 55 m. N.E. of Riga. Wenden was the residence of the grand-master of the Teutonic Knights. It has a fine mediæval church and the ruins of a castle. Pop. 6,400.

Wendover, tn., Bucks, England, 5 m. S.E. of Aylesbury. Pop. 2,000.

Wendron, par. and vil., Cornwall, England, 8 m. W. by S. of Falmouth; has tin mines. Pop. (1911), reg. dist., 6,384.

Wends, Slav community in Upper and Lower Lusatia (Saxony and Prussia). They call themselves Sorbs, and formerly occupied nearly the whole of the Elbe basin; hence are known in history as Polabs. Their language, of which there are two marked dialects—the Saxon and the Prussian—with numerous local and half Germanized varieties, holds an intermediate position between Polish and Czech (Bohemian), and was first reduced to written form in the 16th century. It is steadily yielding to the encroachments of German; and the people of Wendish speech, who in the 'eighties numbered 144,000, were by 1900 reduced to 116,800, of whom 24,000 were bilingual, speaking German as well as their mother tongue. In dress, customs, and religion they are largely assimilated to their German neighbours. See R. Andree's *Das Sprachgebiet der*

lausitzer Wenden (1873), E. Müller's *Das Wendenthum* (1894).

Wendt, HANS HINRICH (1853), German philosopher and theologian, born at Hamburg, became professor of theology at Göttingen (1881-3), thereafter professor of New Testament exegesis in Kiel (1883-5), then of systematic theology at Heidelberg (1885-93), and finally was called to Jena. His chief works are *Die Christliche Lehre von der Menschlichen Vollkommenheit* (1881); *Die Apostelgeschichte*, in Meyer's *Kommentar* (1899); *Das Johannesevangelium* (1900; Eng. trans. 1902); *Die Norm des echten Christenthums* (1893); *Der Erfahrungsbeweis für die Wahrheit des Christenthums* (1897); *Die Lehre Jesu* (2nd ed. 1901; Eng. trans. 1892); *The Idea and Reality of Revelation and Typical Forms of Christianity* (1904); *System der Christlichen Lehre* (1907); and *Die Schichten im vierten Evangelium* (1911).

Wener, LAKE. See VENER.

Wengrow, or WEGROW, tn., Russian Poland, in gov. of and 22 m. N.W. of Siedlce. Pop. 8,700.

Wenlock (including MUCH and LITTLE WENLOCK), munic. bor., Shropshire, England, near the Severn, 14 m. S.E. of Shrewsbury. It has remains of a Cluniac priory, founded about 1080. Coal, iron, and limestone occur in the vicinity. Pop. (1911) 15,244.

Wenlock Beds, the middle division of the Silurian rocks, well developed in western England. To this series belong the highly-fossiliferous limestone rocks known as Dudley Limestone.

Wentletrap (*Scalaria*), a genus of gasteropod molluscs, related to *Turritella*. The shell is beautiful, being usually of a pure lustrous white colour, and spiral in shape, with many whorls. Four species are British, of which

S. communis has a prettily coloured shell; but the most beautiful forms are tropical, and were formerly highly valued by collectors. The precious wentletrap (*S. pretiosa*), from the China Seas, is the largest and most valuable species.

Wentworth, THOMAS. See STRAFFORD, FIRST EARL OF.

Wentworth, WILLIAM CHARLES (1793-1872), Australian statesman and reformer, was born in Norfolk, and admitted to the English bar (1822), returning to Sydney to practise as the first barrister in the country. He established the *Australian* newspaper in order to advocate the cause of the emancipists. He was a strong advocate of colonial responsible government, although he was not a democrat. He led the 'squatters;' would have nothing to do with the agitation against transportation, quarrelling with Robert Lowe (Viscount Sherbrooke) on that question. He strongly advocated the creation of a colonial peerage.

Wentworth Falls, one of the principal tourist districts on the Blue Mts., New South Wales, 62 m. by rail w. by N. of Sydney. In the vicinity are the Valley of Waters, Weeping Rock, and Sublime Point.

Werdau, tn., kingdom of Saxony, Germany, on the Pleisse, 30 m. s. of Leipzig. Its industries include dyeing and cotton and wool-spinning, the manufacture of machinery, paper, motors, and chemicals. Pop. (1910) 20,821.

Werden, tn., Rhine prov., Prussia, on the Ruhr, 6 m. by rail s. of Essen; has manufactures of woollen goods, beer, paper, leather, and shoes. Coal is mined and stone quarried near. Pop. (1910) 12,741.

Werder, tn. in Brandenburg, Prussia, 4 m. w.s.w. of Potsdam, on the Havel. Pop. (1910) 6,757.

Werdohl, vil., Westphalia, Prussia, 25 m. E. of Barmen. It has iron and steel industries. Pop. (1910) 9,819.

Weregild, in Anglo-Saxon and Teutonic law, a fine or pecuniary compensation prescribed for homicide or other crime against the person. It varied in amount according to the offender's rank and station, and that of the person slain or hurt, and also according to the injury sustained. It was in general paid to the relatives of the deceased, or in the case of injury to the person wounded. If the cause was taken into court, the plaintiff only received a portion of the fine, the community or the king receiving the other half.

Were-wolf. See LYCAN-THROPY, also J. C. Lawson's *Modern Greek Folklore and Ancient Greek Religion* (1910).

Wergeland, HENRIK ARNOLDUS (1808-45), Norwegian poet, born at Kristiansund. In 1827 he made his début in letters with a farce, and when only a little over twenty composed what he regarded as his *magnum opus*, the epic *Skabelsen, Mennesket, og Messias*, which comprises a whole philosophy of life. About this time (1830) began his literary feud with Welhaven and his polemical writings on behalf of an independent Norway. In 1835 he published the tragedy *Barne mordersken*; in 1840 *Jan van Huysum's Blomsterstykke*; in 1842 *Jøden*, and in 1844 *Jødinden*, in both of which he courageously advocated the political emancipation of the Jews; in 1844 *Den Engelske Løds*; and in 1845 *Hasselknødder*. In 1839 he was made keeper of the record office. Wergeland's *Samlede Skrifter* were edited by Lassen in 9 vols. (1852-57). See Lassen's *Wergeland og hans Samtid* (ed. 1877); Schwanenflügel's *Henrik Wergeland* (1876); and Skavlan's *H. Wergeland* (1892).

Werl, tn., Westphalia, Prussia, 22 m. E. by N. of Dortmund. Pop. (1910) 7,138.

Wermelskirchen, tn., Rhenish Prussia, 20 m. E. S. E. of Düsseldorf. It has textile industries, and manufactures metallic wares and cigars. Pop. (1910) 16,376.

Werne, comm., Westphalia, Prussia, in circle of and 20 m. N. E. of Bochum. It has iron and steel and chemical works. Pop. (1910) 16,898.

Werner, ABRAHAM GOTTLÖB (1750-1817), German mineralogist and geologist, born at Wehrau in Lusatia; was appointed (1775) professor of mineralogy at Freiberg in Saxony. His theory, in which, roughly put, he held that rocks were primarily of aqueous origin, led to the controversy which divided geologists into two parties, styled Neptunists and Vulcanists. The former was the name applied to the followers of Werner, and the latter to his opponents, of whom the most redoubtable was James Hutton. He wrote *Ueber die äussern Kennzeichen der Fossilien* (1764); *Kurze Klassifikation und Beschreibung der Gebirgsarten* (1787); and *Neue Theorie über die Entstehung der Gänge* (1791). See *Life* by Frisch (1825).

Werner, ANTON ALEXANDER VON (1843), German painter, born at Frankfurt-on-Oder; lived for some years in Italy. He became professor (1873) at the Berlin Academy of Fine Arts, and (1875) director of the same. Many of his most important works are the property of the state—*The Capitulation of Sedan*; *Meeting of Bismarck and Napoleon III.*; the two companion pictures, *Moltke before Paris* and *Moltke at Versailles*; *William I. Visiting the Tombs*; *The Congress of Berlin*.

Werner, ELISABETH, pen-name of Elisabeth Bürstenbinder (1838), German novelist, known under the pseudonym of 'E.' born

in Berlin; has written novels distinguished by singular grace of style and lively dialogue—*c.g. Am Altar* (1873); Eng. trans. *Sacred Vows*, (1878); *Freie Bahn* (1893); *Clear the Track*, (1893); *Frühlingsboten* (1880); *Fickle Fortune*, (1881); *Gebannt und Erlöst* (1884); *Raymond's Statement*, (1884); *Gesprenzte Fesseln* (1875); *Riven Bonds*, (1885); and *Glück Auf* (1874); *Good Luck*, (1890). Many of them were collected as *Gesammelte Novellen* (10 vols. 1893-6; new series, 1901, etc.).

Werner, FRIEDRICH LUDWIG ZACHARIAS (1768-1823), German poet, born at Königsberg. The earlier years of his life were largely spent in sowing wild oats, but in his forty-second year he reformed (1809), joined the Church of Rome (1811), was consecrated priest (1814), and became noted as a pulpit orator. Before this change, his works had mostly been dramas of a gloomy cast, betraying great power, but almost repellent in their aggressive scepticism. His best-known works are *Die Söhne des Thals* (1803), a dramatic poem, divided into the two parts—(1) *Die Tempeler auf Cypern*, (2) *Die Kreuzesbrüder*; *Das Kreuz an der Ostsee* (1806); *Martin Luther* (1807); *Die Mutter der Makkabäer* (1820). See Carlyle's *Miscellanies*, and Madame de Staël's *L'Allemagne*. The best biographies are by Hitzig (1823), Schütz (1841), and Düntzer (1873).

Wernigerode, tn., prov. Saxony, Prussia, at the N. foot of the Harz Mts., 43 m. S. W. of Magdeburg; has a fine library in the old castle. Machinery, brandy, and cigars are manufactured. Pop. (1910) 18,366.

Wernz, FRANCIS XAVIER (1842), general of the Society of Jesus, was born at Rottweil in Württemberg. He entered the society at the age of fifteen, and

thereafter studied canon law at Ditton Hall. In 1883 he became professor in the Gregorian University, of which he has been rector since 1904. He is adviser of the Sacred Congregations of Extraordinary Ecclesiastical Affairs, of the Index, and of the Council. Since 1897 Father Wernz has been engaged on an exhaustive work on canon law, of which he has already published 4 vols. He was elected general in September 1906.

Werther. See GOETHE.

Wervick or WERVICQ, tn., West Flanders, Belgium, 9 m. S.E. by E. of Ypres. Pop. 10,200.

Wesel, tn. and fortress, Rhine Province, Prussia, at confluence of Lippe and Rhine, 35 m. by rail N.N.W. of Düsseldorf. Machinery, metal goods, cement, pottery, bricks, cloth, and soap are manufactured. Pop. (1910) 24,453.

Wesenberg, tn. in Esthonia, Russia, 52 m. E. by S. of Reval. Pop. 5,600.

Weser, riv., Germany, rises as the Werra and Fulda, which join at Münden and flow N. to Bremen. From there the river flows for 40 m. between Oldenburg and Prussia, and enters the North Sea 25 m. S.W. of the mouth of the Elbe. It is 440 m. long, drains an area of over 18,500 sq. m., and is navigable as far as Münden, 270 m. The Fulda is canalized to Kassel. The chief tributary is the Aller.

Wesley, CHARLES. See WESLEY, JOHN.

Wesley, JOHN (1703-91), English religious reformer, was born at Epworth, Lincolnshire; was in 1726 elected fellow of Lincoln College, Oxford, having been ordained in 1725. At the same college his younger brother, Charles Wesley (1707-88), became a member of a religious society derisively called the 'Holy Club,' or 'Methodists.' Other members were James Hervey, author of

Meditations among the Tombs, and George Whitefield, one of the founders of Methodism. At this time, too, the brothers became acquainted with William Law, author of the *Serious Call*, who exercised a great influence upon them. John and Charles were prevailed upon to accompany General Oglethorpe to Georgia, N. America, to preach to the settlers and Indians in a colony which the general was founding there. They sailed from Gravesend in October 1735, and landed on the banks of the Savannah in February 1736. Charles was sent back with dispatches by General Oglethorpe early in 1737, but John Wesley did not leave the colony until December of the same year. On his return he found that the religious enthusiasm which passed by the name of Methodism had been much stimulated by the fervid preaching of Whitefield, who had just gone out to succeed Wesley in Georgia for a year. Wesley was at first inclined to throw in his lot with the Moravians, and both he and Charles owed much to a Moravian missionary, Peter Boehler. About three weeks after his 'new birth,' as he called it, Wesley set out for Germany to visit the Moravian Brethren at their original seat of Herrnhut in Saxony, spending about three months there (June to September 1738). On the arrival of Whitefield, in November, Wesley at once joined him, and they became intimately associated in religious work. The example of preaching in the open air, which Whitefield initiated, was followed by Wesley, while the first separate meeting house of the Methodists was erected in the Horse Fair, near St. James's Church, Bristol (1739). Lay preaching was also sanctioned. In July 1740 John Wesley formally separated himself from the

Moravians, and adopted that system of doctrine and practice now embodied in the standards of the Wesleyan Methodist, Primitive Methodist, and Methodist Episcopal Churches. From this date Wesley worked as the evangelist and missionary organizer. Until his death practically his whole time was given up to preaching, writing books, and travelling from place to place expounding the Word of God. He rarely preached less than three times and frequently as many as five times a day, while he generally rode about forty or fifty miles a day. His brother Charles at this time, as all through, was his faithful coadjutor. About 1738 John Wesley began the gradual establishment of his 'societies,' or churches. In 1743 he drew up a set of rules for them—the rules of the Wesleyan Church to this day. At first the societies were in connection with the Church of England; but Wesley and the preachers he ordained were soon excluded from the pulpits of the Anglican communion. After reading Lord Chancellor King's account of the primitive church, Wesley came to the conclusion that he and Charles had as much right to ordain clergy in accordance with a system of their own as the primitive church had. Thus the Wesleyan organization took shape. In 1741 he also reorganized his staff of lay preachers; and in 1744 the first conference of the societies was held, but it was not legally constituted as the supreme court of a church, dissociated from the Church of England, until 1784. During these years, between 1743 and 1785, the organization increased by leaps and bounds, until it spread all over England. In 1785 Wesley made provision for its extension to America, by giving formal ordination to Dr.

Coke, a presbyter of the Church of England, and the Methodist Episcopal Church came into existence. In 1785 Wesley sent his preachers to Scotland, and shortly afterwards a special form of organization, adapted to Scottish prejudices, came into existence. In 1749 Charles was married to Sarah Gwynne of Garth in Brecknockshire. John was a witness of their conjugal happiness, and in 1751 he married a widow named Mrs. Vizelle. But Wesley had stipulated that he was not to change his mode of life, and his wife being a woman of violent temper, his life was miserable for many years, until she at last left him. Charles confined himself almost wholly to London. He had not his brother's powers of speech, but he had a decided poetical faculty, which he employed in writing hymns. The two Wesleys were not mere ecclesiastics. They were great social reformers and philanthropists. Charity schools were founded by them in London, with an orphan's home in Newcastle, and a medical dispensary for the poor in Bristol.

The works of Charles are contained in the *Methodist Hymnal*, and in the *Poetical Works of John and Charles Wesley* (13 vols. 1868-72). A volume of his *Sermons*, with *Memoir* by J. Jackson, appeared in 1841, and his *Journal*, edited by the same, in 1849. Perhaps John's best single treatises were his *Notes on the Old and New Testaments* (1764), and his *Doctrine of Original Sin* (1757). His complete *Works* appeared in 1818, the eleventh edition containing a *Life* by T. Beecham, and preface by J. Jackson, being published in 15 vols. (1856-7). *Lives of John Wesley* have been written by Southey (1820; new ed. 1903); Tyerman (1870; new ed. 1897); Wedgwood (1870); Ur-

lin (1870); Rigg (1875); Telford (1876; new ed. 1899); Overton (1891); Kirkton (1893); Snell (World's Epoch Makers, 1899); Fitchett (1906); and Winchester (1906): of Charles Wesley, by Jackson (1841); and of the Wesley family, by Stevenson (1876). See also *Wesley and his Century*, by Dr. Fitchett (1906).

Wesley, SAMUEL SEBASTIAN (1810-76), English musical composer, was born in London, and became one of the boys at the Chapel Royal (1819). He was chosen organist of Hereford cathedral (1832), and there produced his anthem *The Wilderness*. He was subsequently organist at Exeter cathedral (1835), and at Leeds parish church (1842), and in 1865 at Gloucester cathedral. Many stories are told of his eccentricities.

Wesleyan Methodist Churches. See METHODISM.

Wessel, JOHANN (1420-89), sometimes called Gansfort or Goesvort, Dutch theologian, born at Groningen, and brought up by the Brethren of the Common Life. He was called 'Lux Mundi' by his friends, but 'Magister Contradictionum' by his enemies, because of his opposition to the Scholastic philosophy. See Ullmann's *Reformers before the Reformation* (1866).

Wessex, KINGDOM OF. In 494 Cerdic landed on Southampton Water, and after years of warfare became king of the West Saxons, or Wessex. For some years the West Saxons halted, and did not advance as far west as Bath. About 570 Ceawlin of Wessex began to make fresh conquests. In 571 he won a victory at Bedford, and in 577 he fought and won the battle of Deorham in Gloucestershire. The West Saxons by this victory secured access to the Bristol Channel, and won Cirencester, Gloucester, and

Bath. The Welsh of Wales were now cut off from the Welsh in Somerset, Devon, and Cornwall. From 613 to 825 Northumbria, Mercia, and Wessex struggled for supremacy. Cenwealh (643-72) and his successors, Caedwalla and Ine, extended the borders of Wessex. Somerset was conquered; London recognized the West Saxon power; and laws were issued. It was not, however, till the reign of Egbert (802-39) that the supremacy of Wessex over Northumbria and Mercia was in any sense assured. Nevertheless the union of England under Egbert was premature, and it required the Danish invasions to force the men of Northumbria and Mercia to recognize the overlordship of Wessex. It was not till after the treaty of Wedmore that Alfred was able to begin the work of reconquering England from the Danes. His successors, Edward the Elder, Athelstan, Edmund, Edred, and Edgar, continued his work; and in Edgar 'the royal power reached its highest point.' The shire system originated in Wessex. From the death of Edgar in 975 to the accession of Canute in 1016, Wessex passed through evil days owing to the attacks of the Danes, who succeeded in placing a Danish dynasty on the throne. See *Wessex*, by W. Tyndale and C. Holland (1906); also works by Thomas Hardy.

West, BENJAMIN (1738-1820), American historical painter, was born in Pennsylvania, and practised as a portrait-painter in New York and Philadelphia before he went to Rome in 1760. He settled in England, and by his picture, *Agrippina Landing with the Ashes of Germanicus*, secured the patronage of George III. By abandoning the pseudo-classic in his *Death of General Wolfe*, he revolutionized English

historical painting. Many of his works are in Windsor Castle. *Edward III. at Cressy*, *Penn's Treaty with the Indians*, and *The Battle of La Hogue* are among his best known works. He succeeded Reynolds as president of the Royal Academy in 1792. See Allan Cunningham's *Lives of . . . British Painters* (new ed. 1879).

West Africa, *British*. See GOLD COAST, GAMBIA, SIERRA LEONE, and NIGERIA.—*French*. See SENEGAL, COLONY AND PROTECTORATE OF; SENEGAL, UPPER, AND THE NIGER, COLONY OF; FRENCH GUINEA, FRENCH CONGO, IVORY COAST, and DAHOMEY.—*Portuguese*. See ANGOLA and PORTUGUESE GUINEA.—*German*. See KAMERUN, TOGOLAND, and GERMAN SOUTH-WEST AFRICA.—*Spanish*. See RIO DE ORO, SPANISH GUINEA, and FERNANDO PO.

West Allis, city, Milwaukee co., Wisconsin, U.S.A., incorporated from parts of Greenfield and Wauwatosa towns in 1906. Pop. (1910) 6,645.

West Bay City. See BAY CITY.

West Berwick, bor., Columbia co., Pennsylvania, U.S.A., incorporated from part of Briar Creek township in 1902. Pop. (1910) 5,512.

Westborough, tn., Worcester co., Massachusetts, U.S.A., 32 m. s.w. by rail of Boston, has a state lunatic asylum. Boots and shoes are manufactured. Pop. (1910) 5,446.

West Bridgford, urb. dist., England, co. of and 2 m. E.S.E. of Nottingham. Pop. (1911) 11,632.

West Bromwich, munic. parl. and co. bor., Staffs, England, 6 m. N.W. of Birmingham, and adjoining Wednesbury. The High Street is $1\frac{1}{2}$ m. long. The town is noted for hardware manufactures; has forges, iron and

brass foundries, and malting. Coal is mined. Pop. (1911) co. bor. 68,345.

Westbrook, tn., Maine, U.S.A., in Cumberland co., 6 m. w. of Portland. It has large paper, cotton, and silk mills. Pop. (1910) 8,281.

Westbury, urb. dist., Wilts, England, 4 m. S. by E. of Trowbridge. It has ironworks and manufactures of woollens, and is an important railway junction. All Saints' Church contains a chained black-letter copy of Erasmus's *Paraphrase of the New Testament*. Pop. (1911) 3,433.

Westbury, RICHARD BETHELL, BARON (1800-73), lord chancellor of England, was born at Bradford-on-Avon. He became a fellow of Wadham College, Oxford, and was called to the bar at the Middle Temple in 1823. He entered Parliament as Liberal member for Aylesbury in 1851, and for Wolverhampton in 1852. He was made solicitor-general in 1852, attorney-general in 1856, and succeeded Lord Campbell on the woolsack in 1861. He delivered the celebrated judgment, in the House of Lords, on the appeals in the *Essays and Reviews* cases. He was in opposition to Gladstone on the Irish Church question, and voted against the Land Act of 1870. See *Life* by T. A. Nash (1888), and Atlay's *Victorian Chancellors* (1908).

Westbury-on-Severn, urban dist., England, co. of and 8 m. w.s.w. of Gloucester. Pop. (1911) 1,812.

West Calder. See CALDER, WEST.

West Chester, residential centre and cap. of Chester co., Pennsylvania, U.S.A., 23 m. w. of Philadelphia; has market-gardening and dairy-farming, and manufactures agricultural implements. Pop. (1910) 11,767.

Westcott, BROOKE FOSS (1825-1901), bishop of Durham,

was born at Birmingham. In 1851 he became a house master at Harrow. In 1869 he was made canon of Peterborough. In 1870 he was elected regius professor of divinity at Cambridge, and the same year acted on the committee for the revision of the New Testament. In 1884 he received a canonry at Westminster. In 1890 he was made bishop of Durham. A few amongst his best-known works are *History of the Canon of the N. T.* (ed. 1866); *The Gospel of the Resurrection* (1866); *The N. T. in the Original Greek* (with Dr. Hort, 1882); *The Revelation of the Risen Lord* (1881); *The Revelation of the Father* (1884); *Christus Consummator* (1886); *The Incarnation and Common Life* (1893); and *Words of Faith and Hope* (1902). See *Life* by his son, B. F. Westcott (1903), and by J. Clayton (1906).

Westerås. See VESTERÅS.

Westerly, tn., Washington co., Rhode I., U.S.A., 40 m. s.s.w. of Providence; has cotton and woollen factories. Granite is quarried. Watch Hill is a summer resort. Pop. (1910) 8,696.

Westermarck, EDWARD ALEXANDER (1862), Finnish writer on sociological subjects, was born at Helsingfors, and became lecturer on sociology, and professor of moral philosophy at the university there in 1890. In 1907 he became professor of sociology at the University of London. He has written some valuable works, including *The History of Human Marriage* (1891; 3rd ed. 1903); 'Le Matriarcat,' in *Annales de l'Institut International de Sociologie* (1906); and *Origin and Development of the Moral Ideas* (1906-8).

Western Australia, a state of the Australian Commonwealth, extends from 13° 30' s. to West Cape Howe 35° 8' s., and from Dirk Hartog's I. in long. 112° 52'

to 129° E., and includes all the continent to the w. of 129° E. long., together with adjacent islands. Total area, 975,920 sq. m. The first Englishman who landed on the coast of what was then New Holland, on Jan. 5, 1688, was Dampier. It was on May 2, 1829, that Captain Fremantle hoisted the British flag. The same year Captain Stirling arrived with the first settlers. In 1830 an Executive Council was appointed, and in 1831 the first Legislative Council came into existence. In 1890, when it had a population of 40,000, it was granted responsible government. Sir John Forrest formed the first ministry, and continued to hold office until 1901. Under his administration state-owned railways were extended to the principal centres; Fremantle was made a first-class port, at an expenditure of over £1,000,000; water is being taken to the mining towns of the interior at an estimated cost of £3,500,000; and a liberal policy of public works has been carried out. This was made possible by the discovery of gold at Coolgardie in 1892. Good harbours are not very numerous. The principal is Fremantle, a few miles below Perth, the capital. The principal river is the Swan; others are the Murchison, Gascoyne, Ashburton, De Grey, and Fitzroy. The climate varies from the excessive heat of latitudes just below the equator to the temperate and cool atmosphere of the south. The north is in every way suited for tropical agriculture, while in the south English cereals, fruits, and vegetables are grown. The rich, black soil of the south-west yields marvellous crops, and has a rainfall averaging from 30 to 40 in., evenly distributed throughout the year. In 1910, 448,918 acres were under wheat, of which 5,602,368 bushels were produced.

The chief other crop was oats, 1,248,162 bushels. In 1909, 27,144,579 lbs. of wool, valued at £1,013,180, were exported. The north of the state is for the most part suited for pastoral occupation. The vast and arid plateaus along the eastern boundary are worthless for settlement. Western Australia produces gold, silver, lead, copper, tin, iron, excellent coal, and also gems. From 1886, when it was first obtained, to the end of 1909 gold has been produced to the value of £91,780,565, the production in 1909 being 1,595,269 fine ounces, valued at £6,776,274. Forest timber is a source of great wealth, karri and jarrah being two of the most valuable hard woods known. Wine is a large product (140,559 gallons in 1910). The fauna is the same as that found elsewhere in Australia. The flora, in addition to that common throughout Australia, has many varieties not found elsewhere. Manufacturing industries are springing up, but their volume is still unimportant. Pearl-shelling is an important industry, and a large amount of guano is shipped from Abrolhos I. In 1909 the imports were £6,407,120, and the exports £8,860,494 (chiefly gold, wool, timber, pearls, hides, coal, copper, and tin), the trade being almost entirely done with the other colonies and the United Kingdom. The government is that of an autonomous British colony, with a governor, a Legislative Assembly of fifty members, and a Legislative Council of thirty members. There is no state church. All denominations have their representatives, including missions to the aborigines. Education is compulsory, secular, and free. In June 1910 there were 2,145 miles of government railways open, of 3 ft. 6 in. gauge, besides over 600 miles of private lines. A transcontinental

railway is to be constructed from Kalgoorli, Western Australia, to Port Augusta, South Australia. The gauge has been fixed at 4 ft. 8½ in. On June 30, 1910, there was a permanent military force of 107 men; but there were also militia, volunteer, rifle club, and cadet forces of a total strength of over 10,000. In 1911, however, a new defence scheme was inaugurated by the Federal Government. Pop. (1901) 184,124, excluding 6,212 natives, and (1911) 280,316. See A. F. Calvert's *Western Australia* (1894); J. M. Price's *The Land of Gold* (1896); Vivienne's *Travels in Western Australia* (1901); and *The Western Australia Official Year Book*.

Western Daily Press, THE, Bristol, was the first daily newspaper to be issued in the west of England. It was founded by Peter Stewart MacIver at Bristol in 1858, on independent lines in regard to politics. Its present proprietor is Mr. Walter Reid.

Western Empire. See **ROME**.

Western Railway of France, established in 1855, was formed by the amalgamation of five companies, and extends from Paris to Rouen, Dieppe, Brest, and comprises most of the lines in Normandy and Brittany. The total length worked is 3,370 m. The government took over the line from January 1, 1909, since which date the services and general working have deteriorated.

Westervik. See **VESTERVIK**.

Westfield. (1.) Town, Hampden co., Massachusetts, U.S.A., 8 m. w. of Springfield, on the riv. Westfield; has manufactures of machinery, radiators, bicycles, paper, cigars, and whips. Pop. (1910) 16,044. (2.) Town, Union co., New Jersey, U.S.A., 8 m. w. of Elizabeth. It manufactures carriages, tools, and cement. Pop. (1910) 6,420.

Westfield College, Hampstead, a constituent college of

the University of London, was founded in 1881 for the preparation of women for the degrees of the university. It accommodates about sixty resident students, for whom the fees are £35 per term; it also receives non-residents.

West Flanders, prov. of Belgium, bounded on the N.W. by the North Sea, and on the W. and S. by France. Its surface is flat, with sand dunes extending along the coast. The S.E. part of the province belongs to the basin of the Scheldt. The soil is in a high state of cultivation. The chief towns are Ostend, Bruges (the capital), Ypres, and Courtrai. Area, 1,249 sq. m. Pop. 880,000.

Westgate-on-Sea, wat.-pl., Kent, England, on St. Mildred and Westgate Bays, 2 m. S.W. of Margate. Pop. 3,000.

West Grinstead. See GRINSTAD.

West Ham. See HAM.

West Hartlepool. See HARTLEPOOL.

West Haven, tn., Connecticut, U.S.A., in New Haven co., adjacent to New Haven. It manufactures motor boats, wire goods, tools, and musical instruments. Pop. (1910) 8,543.

West Hoboken, tn., New Jersey, U.S.A., in Hudson co., 1 m. from Hoboken. It manufactures artificial flowers, silk and embroidery goods, and flowers are raised on an extensive scale. Pop. (1910) 35,403.

Westhoughton, urban dist., Lancashire, England, 5 m. E.N.E. of Wigan. It has silk and cotton factories, print works, and collieries. Pop. (1911) 15,046.

West Indies, an archipelago stretching from Florida to the N. coast of Venezuela. It includes forty inhabited islands, varying in area from less than 5 to 44,000 sq. m. (Cuba). Their total area is estimated at 100,000 sq. m., with a population of some 6,200,000. They

are classified as the Bahamas, the Greater Antilles, the Lesser Antilles (including the Leeward Is. and the Windward or Caribbees Is.), Trinidad-Tobago group, and the keys or coral reefs. Of these, the Greater Antilles are the most important. They include Porto Rico, Santo Domingo, Cuba, and Jamaica. These islands, and the shallow passages between them, separate the Gulf of Mexico from the Caribbean Sea. They have three times the population of the other islands, and nearly nine-tenths of the entire surface of the West Indian group. They are a disconnected chain of mountains, with an east and west trend, and protrude at intervals above the sea, with the greatest elevation, 12,000 ft., in Santo Domingo. The chief industries are sugar, cacao, rice, tobacco, cotton, limes and lime-juice, and rubber. The Bahamas, to the N. of the Greater Antilles, consist of low heaps of calcareous shells and coral sand, which have been piled upon a submerged platform by wind and rain. The 300 islands contain 5,450 sq. m., and include the Caicos and Turks. The Virgin Archipelago, which extends E. from Porto Rico to the Anegada Passage, is Antillean in its natural features. It includes Crab, Culebra, St. Thomas, St. John, Tortola, Virgin, and Anegada. The Lesser Antilles are projecting summits of a submerged ridge. They curve from the Anegada Passage S. to Trinidad, and number twenty-one islands, besides the Grenadines. The northern half of the chain makes a double row of islands. The inner, which stretches between the Greater Antilles and S. America, is the main chain, and includes, Saba, St. Eustatius, St. Christopher, Nevis, Montserrat, Guadeloupe, Dominica, Martinique, St. Lucia, St. Vincent, Grenadines, and Grenada. They

rise precipitously above the sea, attaining a height of 4,450 ft. in Martinique, and are clad to the top with vegetation, and usually clouded in mist. They are composed entirely of old volcanic material. The outer chain of islands, including Sombbrero, Anguilla, St. Martin, St. Bartholomew, Barbuda, Antigua, Desirade, and Marie Galante, with the exception of Antigua, which is partially volcanic, are limestone and coral rocks, and are nowhere over 200 ft. above the sea. They rise from a submerged slope extending oceanward from the inner chain. The fourth group border the N. coast of S. America, and include Tobago, Trinidad, Margarita, Blanquilla, Los Roques, Buen Ayre (Bonaire), Curaçao, Aruba, and other small islands. These were once portions of the S. American continent. There are many islands standing isolated, like Barbados, Aves, and Swan I., and many others off the Central American coast, which, from their natural relations, may be considered continental. Several of the islands suffer from earthquakes and volcanic outbursts.

A great drawback to the W. Indies is their political condition. Only two islands, Santo Domingo (with Haiti) and Cuba, possess free and independent governments. The Spanish islands Porto Rico, Vieques, and Culebra passed to the United States after the Spanish-American war. British islands — Bahamas, Jamaica, Turks, St. Christopher, Nevis, Antigua, Montserrat, Dominica, St. Vincent, Grenada and Grenadines, Barbados, Virgin Is., St. Lucia, Tobago, Trinidad. The British islands have an area of nearly 13,000 sq. m. and a pop. of about 1,400,000. In 1909 their total imports were valued at £8,445,130, and their exports at £7,808,708. A royal commission

appointed in 1909 to consider the trade relations between Canada and the West Indies opened its investigations at Kingston in Feb. 1910, and issued its report in the following September. They advocated the grant of reciprocal preference, except in the case of Jamaica, recommended a better steamship service, and were in favour of the public ownership and operation of telegraph cables in the West Indies. French islands — St. Bartholomew, Guadeloupe, Martinique. Dutch islands — St. Eustatius, Saba, Curaçao, Buen Ayre, Aruba. French and Dutch — St. Martin. Danish — St. Thomas, St. John, and Santa Cruz. A proposal was made in 1904 to sell the Danish islands to the United States, but the bill was rejected by the Danish Parliament.

The W. Indies were discovered by Columbus in his different voyages from 1492 to 1498. First, the Spaniards conquered the aborigines; then English, Dutch, French, and Danes strove for possession of them. Here Morgan, Drake, Grenville, De Grasse, Rodney, Nelson, Albemarle, and others won victories or suffered defeat. African slaves, imported to cultivate the sugar plantations, rose from time to time in revolt, and in some cases they won a success so complete as to banish European life and civilization. See Fiske's *The West Indies* (1899); Froude's *The English in the West Indies* (1888); R. T. Hill's *The Geology and Physical Geography of Jamaica, Cuba, and Porto Rico, with the other Islands of the West Indies* (1898); Bulkeley's *The Lesser Antilles* (1889); Dodsworth's *The Book of the West Indies* (1904); Rodway's *The West Indies and the Spanish Main* (1896); Garaud's *Trois Ans à la Martinique* (1892); Walker's *The West Indies and the Empire* (1901); Lucas's *The West Indies* (1905); A. E. Aspinall's

The Pocket Guide to the West Indies (1907); and Sir H. H. Johnston's *The Negro in the New World* (1910). For Danish islands, Taylor's *Leaflets from the Danish West Indies* (1888).

Westinghouse, GEORGE (1846), American inventor, born at Central Bridge, Schoharie co., New York. After serving in the Union army (1863-4), he became an assistant engineer in the United States navy; invented a device (1865) for replacing railway cars on a track in case of accident; afterwards (1868) invented the Westinghouse air-brake, and numerous other railway appliances. He has also devoted himself to the development of electrical industries, especially in the use of alternating current for power and lighting and its long-distance transmission, made possible by the invention of Tesla's induction motor.

Westinghouse Brake. See BRAKES.

Westland, provincial dist., South Island of New Zealand, a narrow strip of country on the west coast, 200 m. long by 30 m. broad, with an area of 4,641 sq. m. It is a vast alluvial gold field, sloping from the Southern Alps to the ocean. Chief towns: Greymouth, Hokitika, Kumara, and Ross. Chief products: gold, timber, and coal. Pop. 14,700.

West Lothian. See LINLITHGOWSHIRE.

Westmacott, SIR RICHARD (1775-1856), English sculptor, was born in London, and was a pupil of Canova in Rome. He returned to London (1797), became R.A. (1811), and was knighted in 1837. His work was chiefly of a monumental character, and favourable specimens are to be seen in his monuments to Pitt, Fox, and Addison, in Westminster Abbey; to Abercromby and Captain Cook, in St. Paul's; in the *Achilles*, a colossal

bronze statue in Hyde Park; and, jointly, with Flaxman and Baily, he executed the reliefs on the Marble Arch. He was professor of sculpture at the Royal Academy from 1827 until his death.

Westmacott, RICHARD (1799-1872), English sculptor, son of the above, was born in London, and lived in Italy (1820-6). After his return to England he became famous; was created R.A. in 1849, and appointed (1857) to the professorship of sculpture. His work latterly consisted chiefly of busts, including Newman, Lord John Russell, and Sir Roderick Murchison; but he also produced *Ariel* (1841), *The Soul Enslaved by Sin* (1847), and *David* (1852).

Westmann (or VESTMANNA) Islands, a group off the S. coast of Iceland, 70 m. S.E. of Reykjavik. Cured cod and cod-liver oil are exported. Pop. 1,400.

Westmeath, inland co., prov. Leinster, Ireland. The surface is varied and very picturesque, with scattered hills (highest in N. 850 ft.). It is drained chiefly to the Shannon; E. are affluents of the Boyne. The Royal Canal crosses the centre, and affords communication with Dublin. Lakes form a characteristic feature. Agriculture is the chief occupation, oats and potatoes being the principal crops; and dairy-farming is important. Coarse stuffs are manufactured for domestic use. The county returns two members to Parliament. Area (admin. co.), 708 sq. m. Pop. (1911) 59,812.

Westminster, CITY OF, is the greatest of the twenty-eight metropolitan boroughs which together form the county of London. Area, 2,502 acres. Pop. (1911) 160,277. (See LONDON.) Under its original name of the Isle of Bramble or Thorn-ea, Westminster was a place of importance before London existed. The Saxon king Sebert (597-616) built a monastery on the site now occu-

pied by the abbey. Offa (700) is said to have had a 'king's house' there. King Canute the Dane (1017-35) began the building of what became the palace of Westminster, in which the sovereigns of England held their court for five hundred years, and Edward the Confessor (1042-66) rebuilt Sebert's monastery on a scale of great magnificence. This new house he called West Minster, by which name both the abbey and Thorn-ea have since been designated. Henry III. (1216-72) pulled the minster down, and, for the purpose of doing honour to the Confessor's memory, began the erection of a more splendid building, which was completed by Edward I. (1272-1307) and succeeding sovereigns. The abbey, indeed, as it has come down to us, represents the work of something like five hundred years. After the revolution the abbey was thoroughly repaired, and the western towers were added by Sir Christopher Wren. The total exterior length is 530 ft., and of the transepts 200 ft. The nave is 38 ft. wide without the aisles, and is over 100 ft. high. The reredos, completed under the direction of Sir Gilbert Scott, is an elaborate piece of work. In the interior the 'Poets' Corner' is of special interest. The south transept is reserved for famous writers. Since the reign of Harold the kings and queens of England have been crowned in Westminster Abbey. But while the glorious West Minster has been preserved, all that now remains of the palace begun by Canute is the beautiful hall built by William Rufus (1097), in which Charles I. was tried and condemned, and the crypt. The hall was repaired in 1397 by Richard II. The Houses of Parliament, Westminster Hall, and New Palace Yard now cover the site of this old palace. It had ceased to be used

as a 'king's house,' however, in the reign of Henry VIII. (1509-47), who moved the court to White Hall, which, as York Place, had been for 250 years the town house of the archbishops of York. White Hall was in great part destroyed by fire in 1691, and Inigo Jones prepared designs for a new palace. The Banqueting House was completed, and this was all that escaped destruction in the second fire, in 1698, which reduced the remains of old White Hall to ruins. It was out of one of the windows of the Banqueting House that Charles I. stepped on to the scaffold. It is now used as a museum of historical relics. Two royal palaces still exist in Westminster—St. James's Palace, built by Henry VIII. in 1532; and Buckingham Palace, a comparatively modern structure. Kensington Palace, where Queen Victoria was born, is just beyond the limits of Westminster. Parliament was first called to Westminster in the reign of Edward I., and there it has continued to sit till the present time. The Commons met for three hundred years in the chapter house of the abbey, and for the next three hundred years in St. Stephen's Chapel, built by King Stephen (1135-54). The Houses of Parliament were burned down in October 1834, Westminster Hall and the crypt of St. Stephen's alone being saved. The present houses, erected from the designs of Sir Charles Barry, were seventeen years in building (1840-57). St. Margaret's Church stands close to the abbey. It is said to have been founded by Edward the Confessor. Westminster school, which in the 18th century was a rival of Eton, dates its origin from the time of Queen Elizabeth, though it is the immediate successor of a grammar school which was in existence before the Reformation. The schoolroom was formerly the abbot's dormitory. The first printing-

press used in England, Oaxton's, was set up in Westminster, within the abbey precincts. Some of the greatest figures in English literature, and many of those who played a prominent part in the country's history, lived in Westminster. The chief government offices, the National Gallery, the Tate Gallery of British Art, the National Portrait Gallery, the Roman Catholic Cathedral (with a campanile 283 ft. high), the splendid new Methodist Church House, and Westminster School (or St. Peter's College) are among the principal modern buildings in the city of Westminster.

Westminster, DUKES OF. This noble house traces its descent in the male line to a Norman family. The founder of the English Grosvenors, Gilbert le Grosvenor, came over in the train of the Conqueror. Robert, the first Marquis of Westminster (1767-1845), was son of the first Earl Grosvenor (d. 1802). He was succeeded by the second marquis, Richard (1795-1869), whose son, Hugh Lupus (1825-99), was created a duke (1874); and was succeeded, as second duke, by his grandson, Hugh Richard Arthur (1879), who was son of the first duke's deceased eldest son, Earl Grosvenor (1853-84).

Westminster Assembly of Divines, a body of 121 clergymen and 30 laymen, all representative of England, with 4 ministers and 3 laymen delegates from Scotland, who were appointed by the Long Parliament to decide what form of doctrine and church government should be followed in England and Scotland. The Assembly sat from July 1, 1643, to Feb. 22, 1649. Among the most celebrated of its clergy were Ussher, Twisse, Burges, Goodwin, Salamy, with the Scotsmen Henderson and Rutherford; while among the laymen were Selden, Vane, Rouse,

Pym, and Prideaux, with the Scots representatives, John Earl of Cassilis, John Lord Maitland, and Sir Archibald Johnstone of Warriston. After affirming the Solemn League and Covenant, the Assembly accepted the resolutions regarding (1) the Directory of Worship; (2) the Confession of Faith; (3) the Shorter and the Larger Catechism. The tenor of the conclusions arrived at was strongly Calvinistic, and inclined towards the Presbyterian system of ecclesiastical polity. See Dr. Hetherington's *History of the Westminster Assembly* (ed. 1891), and Mitchell's *Westminster Assembly* (1883).

Westminster Gazette, THE, was founded in 1893 by Sir George Newnes, the proprietor of *Tit-Bits*, to supply the demand for a Liberal evening paper of the class of the earlier *Pall Mall Gazette*. Mr. E. T. Cook, late editor of the *Pall Mall*, became the first editor of the *Westminster*, and with him went Mr. (now Sir) F. Carruthers Gould, whose well-known cartoons have become a distinctive feature of the paper. When Mr. Cook retired (1895) he was succeeded by Mr. J. A. Spender. The Saturday issue consists of additional literary columns, general articles, and short sketches, while its book reviews are always well written and authoritative. In 1908 the paper came into the possession of a syndicate of prominent Liberals, and it has been made a *sine qua non* that all shareholders should belong to the Liberal party.

Westmorland, N. co., England, E. of Cumberland, and forming part of Lake district. The surface is mountainous, with tracts of moorland N.E. and N. Many summits exceed 2,000 ft.; highest in N.E., Fairfield (2,863 ft.), Millbourne Forest (2,780 ft.), High Street (2,663 ft.), Knock Fell (2,604

ft.); on the w. borders are Helvellyn (3,118 ft.) and Bow Bell (2,900 ft.). The chief rivers are the Eden, N.E.; Lune and Kent, S. On the w. border are Ullswater and Derwentwater; and within the county, Windermere, Hawes Water, Grasmere, and Rydal Water. Cattle and large numbers of sheep are pastured. Gypsum, granite, slate, and limestone are quarried, and some lead is mined. Woollen goods, paper, explosives, and hoblins are manufactured. The county returns two members to Parliament. Area, 790 sq. m. Pop. (1911) 63,575. See *Victoria County History—Westmorland*.

West New York, tn., New Jersey, U.S.A., in Hudson co., across the Hudson R. from New York, with which it is connected by ferry. Silk goods and cottonseed oil are manufactured, and there are large grain elevators. Pop. (1910) 13,560.

Weston, par. and vil., Somersetshire, England, 2 m. N.W. of Bath, of which it is practically a suburb. Pop. 5,000.

Weston, EDWARD (1850), English electrician, went to the United States (1870) as chemist to the American Nickel-plating Co., for which he invented many new instruments, especially dynamo-electric machines, erecting a factory at Newark for their production in 1875. This was subsequently amalgamated (1881) with the U.S. Electric Lighting Co., for which new organization he was electrician until 1888. He invented a group of meters for electrical measurements.

Weston-super-Mare, wat.-pl., Somerset, England, on Bristol Channel, 20 m. S.W. of Bristol, at the base of Worlebury Hill, crowned by an ancient camp. It has potteries, a marine esplanade, piers, pavilions, swimming-baths, and golf links. Pop. (1911) 23,235.

West Orange, tn., New Jersey, U.S.A., in Essex co., 10 m. W. of

New York, and adjoining the city of Orange. It is chiefly a residential town, but the laboratory and manufacturing works of Thomas A. Edison are situated here. Pop. (1910) 10,980.

Westphalia, prov. in the W. of Prussia, between Hanover and Hesse-Nassau, the Rhine Province, and Holland. The greater part of the surface is hilly, the Weser Mts. and the Teutoburger Forest in E., and Sauerland Mts. and Westerwald in the S.; the remainder belongs to the N. German plain. The province lies generally on the watersheds between the Weser, Ems, and Rhine. It possesses vast deposits of coal in the basin of the Ruhr. Iron is extensively mined; and zinc, lead, copper, pyrites, salt, antimony, and quicksilver are also extracted. Iron and steel, tin, bronze, brass, Britannia metal, and similar industries, are carried on on a vast scale at Bochum, Dortmund, Hagen, Iserlohn, Altona, Siegen, Lüdenscheld, and other towns. During 1909, 82,788,321 tons of coal, 15,035,440 tons of coke, 3,207,997 tons of briquettes, 458,004 tons of tar, and 344,000 tons of iron ore were produced in the Mining Board district of Dortmund. Westphalia produces about 60 per cent. of Germany's coal production, and gives employment to 341,000 coal miners. The other industries include linens (Bielefeld, Herford), leather, glass, cottons, paper, chemicals, sugar, pottery, tobacco. Agriculture also stands at a relatively high level. The breeding of cattle and horses is important. There are several mineral springs. Westphalia produces noted hams. Area, 7,800 sq. m. Pop. (1910) 4,125,904. Cap. Münster. The treaty of Westphalia, which wound up the Thirty Years' war, was signed at Münster in 1648.

The kingdom of Westphalia,

which lasted from 1807 to 1813, was created by Napoleon and bestowed upon his brother Jerome. It embraced a large part of Low Germany between the Elbe and the Rhine—i.e. north-west of a line drawn from the Main to the Havel, and amounting to an area of 14,625 sq. m., and a population of approximately 2,000,000. Its capital was Cassel. In 1810 it was enlarged by the addition of Hanover, giving another 9,950 sq. m. and 650,000 inhabitants; but in 1812 the whole of the northern regions extending from the Elbe near Lüneburg to Wesel on the Rhine were incorporated in France, thus reducing its area to 17,535 sq. m., and its population to 2,066,000. After the congress of Vienna (1815) the old limits of the Prussian province were re-established. See *Die Hütten- und Metallindustrie Rheinlands und Westfalens* (4th ed. 1905).

West Pittston, tn., Pennsylvania, U.S.A., in Luzerne co., 11 m. s.w. of Pittston. It has machine works, mine screen works, cut-glass works, silk mills, and anthracite mines. Pop. (1910) 6,848.

West Point, military academy of the United States, in state of and 45 m. N. of New York, on r. bk. of Hudson R. The average number of cadets is about 450, and the whole number of graduates, from 1802 to 1910 inclusive, has been 4,935. In 1908 Constitution Island, lying directly opposite, was gifted to West Point and added to the military reservation.

Westport. (1.) Mrkt. tn. and seapt., Co. Mayo, Ireland, with port on Clew Bay; a favourite seaside resort. It has considerable trade in agricultural produce and provisions. Beer and mineral waters are manufactured. There is weekly steamer communication with Glasgow and Liverpool. About 6 m. w.s.w. is Croagh

Patrick, an isolated conical hill, 2,510 ft. high. It is a noted place of pilgrimage owing to its reputed association with St. Patrick. Pop. 3,800. (2.) Seapt. tn., on W. coast of South Island of New Zealand, 145 m. s.w. of Nelson. Exports gold and coal. Pop. 4,000.

West Prussia. See PRUSSIA, WEST.

Westrumite, a road-dust preventing material, which has for its main ingredients petroleum and ammonia. With the spread of motoring, it has been extensively used by county and borough councils and other municipal authorities in order to minimize the objectionable and harmful dust-raising tendency of cars.

West Seneca, tn., Erie co., New York, U.S.A., 4 m. s.s.e. of Buffalo. There are large steel works. Pop. (1910) 4,605.

West Springfield, tn., Massachusetts, U.S.A., in Hampden co., opposite Springfield, on the Connecticut R. The chief industrial establishments are paper mills and railroad repair shops. Pop. (1910) 9,224.

Weststellingwerf, comm., Netherlands, in Friesland, 6 m. s.s.e. of Heerenveen. Pop. (1910) 16,519.

West Tampa, tn., Florida, U.S.A., in Hillsboro co., 2 m. W. of Tampa. Pop. (1910) 8,258.

West Virginia, an eastern state of the United States of America, lying between 37° 15' and 40° 42' N. lat. and 77° 40' and 82° 40' W. long., with an area of 24,170 sq. m., of which 148 sq. m. are water. It was admitted in 1863, during the civil war, its area being taken from Virginia. It lies almost entirely on the Alleghany plateau (4,000 ft.), and stretches down to the Ohio R., being drained by the Monongahela, Kanawha, Big Sandy, and smaller streams. Its highest point is Spruce Knob (4,860 ft.). Except

where cleared for cultivation, the land is covered with forests. The capital is Charleston, but the largest and most important city is Wheeling. West Virginia University, founded in 1867 at Morgantown, had 1,422 students in 1910. Apart from mining, the chief industry is farming. West Virginia also produces iron and steel goods, lumber and flour. The mineral wealth consists of iron, coal, petroleum, and natural gas. Pop. (1910) 1,221,119. See *Fast and Maxwell's History and Government* (1908), V. A. Lewis's *History of West Virginia* (1904), and the official *Manual of West Virginia*.

Westward Ho, wat.-pl., Devonshire, England, on Bideford Bay, 2 m. N.W. of Bideford, and in Northam urban dist.; named after Charles Kingsley's novel. The United Service College was established here in 1874.

Westwood, JOHN OBADIAH (1805-93), English entomologist and palaeographer, was born in Sheffield. One of the founders of the Entomological Society (1833), he became Hope professor of zoology at Oxford (1861). His works include *British Butterflies* (1841) and *British Moths* (1843-5); and he edited *The Utrecht Psalter* (1874), and *The Book of Kells* (1887).

Wet, DE. See DE WET.

Wetaskiwin, tn., Alberta, Canada, 39 m. S. of Edmonton, in the centre of a magnificent farming district. Pop. 3,500.

Wetheral, par. and vil., Cumberland, England, on the Eden, 4 m. E. by S. of Carlisle. Here are the ruins of a Benedictine abbey. Pop. (1911) reg. dist. 3,585.

Wetherby, mrkt. tn., W. Riding, Yorkshire, England, on the Wharfe, 11 m. N.E. of Leeds. Pop. (1911) reg. dist. 16,210.

Wetherell, ELIZABETH. See WARNER, SUSAN.

Wette, DE. See DE WETTE.

Wetter, vil., Westphalia, Prussia, on the Ruhr, 10 m. S.S.W. of Dortmund. Pop. (1910) 9,161.

Wetter, LAKE. See VETTER.

Wetteren, tn., prov. of East Flanders, Belgium, on the Scheldt, 9 m. E.S.E. of Ghent; has textile industries. Pop. 16,500.

Wetterhorn, Alpine peak, rises E. of the Grindelwald valley in Switzerland, in the Bernese Oberland range. It is composed of three summits—the Mittelhorn (12,166 ft.), first climbed in 1845 by Speer, a Scotsman; the Hasli Jungfrau (12,149 ft.), first ascended in 1844 by two Hasli guides, but its ascent from Grindelwald by Mr. Justice Wills in 1854 is generally taken as the date of the commencement of modern mountaineering; the Rosenhorn (12,110 ft.), first attained in 1844 by Desor's party. An aerial mono-rail, to the height of over 7,700 ft., was constructed in 1906.

Wettin, HOUSE OF, a German dynastic family from which the reigning Saxon lines are descended. The ancestor is one Teti, a count in the Saale valley in the middle of the 10th century. Towards the end of the 11th century Henry of Wettin added Lusatia and the mark of Meissen to the family dignities, and henceforth the Wettins held a very influential position in the empire. Naumberg was the capital of their dominions. Eventually the mark of Meissen grew into the electorate, later into the kingdom of Saxony. Wettin was the surname of Prince Albert, and is that of the present reigning royal family of the United Kingdom. See Hofmeister's *Das Haus Wettin* (1889).

Wettingen, comm., Switzerland, in Aargau canton, 13 m. N.W. of Zürich. Pop. (1910) 5,976.

Wetzer, HEINRICH JOSEPH (1801-53), German theologian, born at Anzefahr in Hesse, and

was appointed professor of Oriental philology at Tübingen (1830). He collaborated with Welte in the compilation and publication of the *Kirchen-Lexikon der Katholischen Theologie* (12 vols. 1846-60), a new edition of which was prepared by Hergenröther and Kaulen (1882, etc.).

Wetzikon, comm., Switzerland, canton of and 12 m. E.S.E. of Zürich. Pop. (1910) 6,344.

Wetzlar, tn., Rhine Prov., Prussia, on the Lahn, 33 m. N.N.W. of Frankfurt-on-Main; has manufactures of gloves, optical instruments, and chemicals. Iron is mined. Goethe lived here in 1772, and makes it the scene of his *Sorrows of Werther*. Pop. (1910) 13,387.

Wexford. (1.) Maritime co., prov. Leinster, S.E. Ireland. It is hilly in N. and W., with Mt. Leinster (2,610 ft.), Blackstairs Mts. (2,409 ft.), and others on W. border. Among the principal inlets are Wexford Harbour and Bay, E.; and Waterford Harbour, S. Dangerous sand-banks occur off the E. coast; S.E. is Tuskar Rock, with lighthouse; and S. the Saltee Is. Rivers are Barrow on W., navigable for large vessels to New Ross, and connected by the Grand Canal with Dublin; and Slaney, navigable for barges to Enniscorthy. Nearly one-third of the surface is under tillage. Limestone is quarried. The county returns two members to Parliament. Area, 901 sq. m. Pop. (1911) 102,287. (2.) Municipal bor. and seap., cap. of Co. Wexford, Ireland, on the Slaney, 12 m. N.N.W. of Carnsore Point. It has whisky-distilling, brewing, malt works, iron foundries, hat factory, and lime and cement works, and important fisheries. The harbour formed by the estuary of the Slaney is obstructed by a bar, but in 1906 an artificial harbour was opened at Rosslare (about 6 m. S.S.E.) in connection

with the new Great Western Railway route from England via Fishguard (Wales). Pop. (1911) 11,455. See *The History of the Town and County of Wexford*, ed. by P. H. Hore (1906).

Wexio. See VEXIO.

Wey, riv., in cos. of Hampshire and Surrey, England, rises about 2 m. S. of Alton in Hampshire, and flows in a general N.W. direction to the Thames at Weybridge. Length, 35 m.

Weybridge, urban dist., Surrey, England, at the junction of the Wey and the Thames, 17 m. S.W. of St. Paul's, London. Weybridge is a residential town. The Brooklands racing track was opened here in 1907. Pop. (1911) 6,286.

Weyden, ROGIER VAN DER (1400-64), Flemish artist, born at Tournai. He settled in Brussels (1435). Among his best-known works are *The Descent from the Cross*, *The Expulsion of Adam and Eve from Paradise*, and several representations of the *Virgin and Child*. See *Life*, in French, by Wauters (1856).

Weyland. See WAYLAND.

Weyler y Nicolau, VALERIANO, MARQUIS OF TENERIFE (1839), Spanish statesman, born at Palma in Majorca. The severity with which he stamped out revolt in certain parts of Cuba caused other parts to rebel, and induced the Spanish-American war. He conducted successful campaigns in Cuba (1868-72), against the Carlists in Northern Spain (1875-76), and in Mindanao (Philippines).

Weyman, STANLEY JOHN (1855), English historical novelist, born at Ludlow; became a barrister (1881). He has published *The House of the Wolf* (1889), *A Gentleman of France* (1893), *Under the Red Robe* (1894), *My Lady Rotha* (1894), *The Red Cockade* (1895), *The Man in Black* (1896), *The Castle Inn* (1898), *Count Hannibal* (1901), *In King's*

Byways (1902), *The Long Night* (1903), *The Abbess of Vlaze* (1904), *Starvecrow Farm* (1905), *Chip-pinge* (1906), *Laid up in Lavender* (1907), and *The Wild Geese* (1908).

Weymouth. (1.) Municipal bor., seapt., and wat.-pl., Dorsetshire, England, 8 m. s. of Dorchester, at the mouth of the Wey, with esplanade stretching along Weymouth Bay. A bridge connects with Melcombe Regis, on the N. (included in the borough). The Nothe, a promontory with fort, separates the harbour from Portland Bay. Westham is a suburb. The chief industries are the quarrying of Portland stone, boat-building, rope and sail making, and brewing. Pop. (1911) 22,325. (2.) Town, Norfolk co., Massachusetts, U.S.A., 11 m. s.s.e. of Boston; has wool-scouring and manufacture of boots and shoes. Pop. (1910) 12,895.

Weyprecht, KARL (1838-81), Arctic explorer, born at König in Hesse-Darmstadt. After serving in the East and in N. America, he conducted (1871-4) an expedition to the North Pole on board the *Tegetthoff*, which resulted in the discovery of Franz Josef Land. His principal works were *Die Metamorphosen des Polareises* (1878) and *Praktische Anleitung zur Beobachtung der Polarlichter* (1881). See Littrow's *Karl Weyprecht* (1881).

Whale, a general name applied to all the larger members of the Cetacea, which are divided into the two suborders of the whalebone whales and the toothed whales. One of the most striking characters of the former is the presence in the mouth of the plates of baleen, the substance popularly called whalebone. The baleen apparatus of the whalebone whales is made up of a large number of flattened plates, which hang down freely in the mouth cavity. Their function is to strain

from the water the small organisms upon which the whales feed. The whalebone whales are further characterized by the very loose attachment of their ribs to the backbone, so that the chest can be greatly expanded. This permits the whale to remain a long time under water without coming up to breathe. After birth teeth are completely absent; but the fact that rudimentary teeth are present before birth shows that these whales are descended from ancestors in which teeth were present. Existing whalebone whales belong to the following genera: *Balæna*, including the right whales; *Balænotera*, including the fin-whales or rorquals; *Megaptera*, including the humpback whale; *Rhachianectes*, including the gray whale of the Pacific; and *Neobalæna*, including the rare pigmy whale of southern seas, whose whalebone is very valuable. The gray whale (*R. glaucus*) attains a length of over forty feet, and has short yellow whalebone. The humpback (*M. boops*) is remarkable for the great length of its flippers.

In the toothed whales there is no whalebone, and teeth are present; there are also several anatomical distinctions from the whalebone whales. Important toothed whales are the cachalot, the bottlenose, the beluga, the grampus, the narwhal, the beaked whales (*Mesoplodon*), and the dolphin and porpoise. Very many of these are hunted for their oil, a product also yielded by the whalebone whales. See *Cetacea*, by W. N. Lockington (1838); Gray's *Brit. Mus. Cat. of Seals and Whales* (1866-71); Flower and Lydekker's *Mammals* (1891).

Whale, THE, a poem of between eighty and ninety lines in the *Exeter Book*, forms part of the Old English *Physiologus*. The old story of the sailors mistaking the whale for an island,

familiar in *Sindbad the Sailor*, and furnishing Milton's well-known simile in *Paradise Lost*, i. 203, is found here.

Whalebone. See WHALE.

Whale - louse (*Cyamus*), a genus of amphipod Crustacea, whose members are parasitic on the skin of whales. The body is broad and flat, and corresponds to the thorax of other Crustacea, the abdomen being rudimentary. There are four pairs of clawed limbs, by means of which the animals attach themselves to their host, and two pairs of gills. The whale - lice are allied to the skeleton-shrimps (*Caprella*).

Whalley, EDWARD (d. 1675), English regicide, was born at Stanmore in Sussex. On the outbreak of the civil war he joined the parliamentary forces, and in 1649 was one of the commissioners for the trial of Charles I., and signed the death-warrant. He was one of the major-generals (1655) through whom Cromwell governed. At the restoration a price was set on his head, but he escaped to New England.

Whalsay, isl., Shetland, Scotland, 14 m. N.E. of Lerwick. Pop. (1911) 1,042.

Whangarei, tn., Whangarei co., North Island, New Zealand, 82 m. N.N.W. of Auckland, at the head of Whangarei Bay. The district produces coal, timber, gum, oranges, and lemons. Pop. 2,200.

Wharfe, riv., Yorkshire, England, rises on Cam Fell, and flows S.E. to the Ouse near Ca-wood. Length, 60 m. Wharfedale is noted for its beautiful scenery.

Wharnccliffe, JAMES ARCHIBALD STUART WORTLEY MACKENZIE, FIRST BARON (1776-1845), British politician, became a member of the House of Commons in 1797. He was a moderate Tory, supporting the Liverpool ministry. In Peel's administration

he was president of the Council (1841-5).

Wharnccliffe Meeting, a meeting of a company held in compliance with Standing Orders 62 to 66 of both houses of Parliament, to obtain the consent of the proprietors to a private bill which is either promoted by the company, or confers upon it powers to do any act which is not authorized by its existing powers. The Standing Orders were first made by the House of Lords in 1858, at the instance of Lord Wharnccliffe, and, *mutatis mutandis*, they were adopted by the House of Commons.

Wharton, par., Cheshire, England, near the Weaver, 3 m. W. by N. of Middlewich. Salt is produced in large quantities, and there are manufactures of artificial manures and boat-building. Pop. 3,300.

Wharton, PHILIP WHARTON, DUKE OF (1698-1731), Irish politician and orator. By his eloquence he so served the government that he was rewarded with an English dukedom (1718), and in the British House of Lords he became a conspicuous opponent of the administration. His manner of life was extravagant, and in 1724 he found it convenient to travel on the Continent, where he became entangled with the Pretender; and in 1727 fought with the Spaniards against his own countrymen at Gibraltar. He was in absence convicted of high treason, and spent the remainder of his life in debauchery in France and Spain. See *Life and Writings of Philip, late Duke of Wharton* (2 vols. 1732).

Wharton, THOMAS WHARTON, MARQUIS OF (1640-1715), British politician, and father of the Duke of Wharton, was brought up in the strictest sect of the Puritans, but the emancipated precisian managed to astonish even the restoration observers. About 1679 he

became interested in politics, in which he was very successful as a party manager. He acted with the Whig party, corresponded with the Prince of Orange, and is reputed to have written *Lillibullero*, which did more harm to James II. than all his politics. In 1708 he became lord-lieutenant of Ireland—a post which he held till 1710.

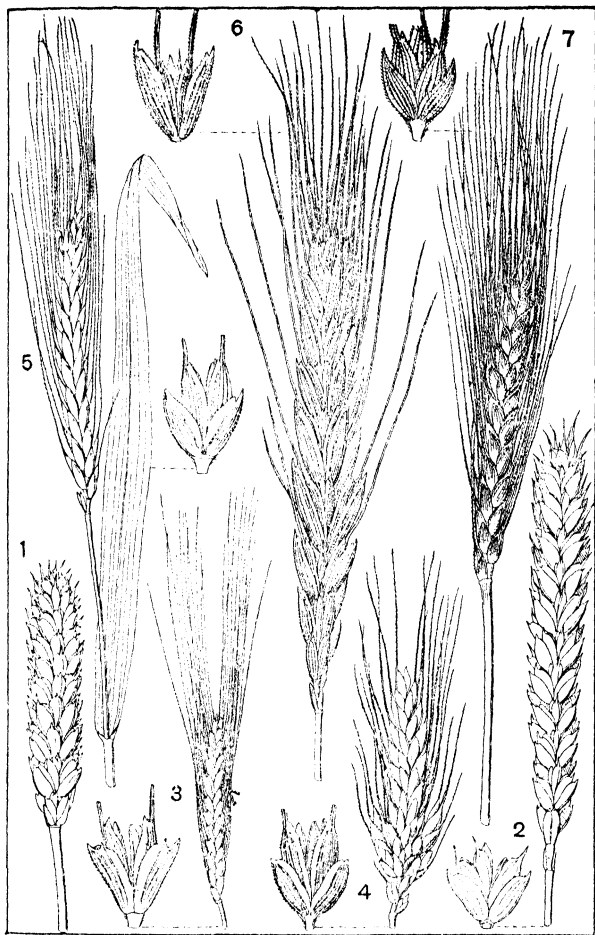
Wharton's Duct, the duct leading from the submaxillary gland into the mouth, and opening under the tongue through a papilla at the side of the fold of membrane that joins the tongue and the floor of the mouth.

Whately, RICHARD (1787–1863), archbishop of Dublin, was born in London, and became a fellow (1811) of Oriel College, Oxford. In 1821 he was appointed to the living of Halesworth; was Bampton lecturer (1822); principal of St. Alban Hall, Oxford (1825); professor of political economy (1829); and archbishop of Dublin (1831). Whately was a Liberal in politics and religion, one of the founders of the Broad Church school, and strongly in favour of unsectarian religious education. Among his numerous writings were *Logic* (1826), *Rhetoric* (1828), *Historic Doubts Relative to Napoleon* (1819), *Essays on the Peculiarities of the Christian Religion* (1825), *Christian Evidences* (1837), *The Kingdom of Christ* (1841). See *Life and Correspondence* (1866) by his daughter, and *Memoirs* by W. J. Fitzpatrick (1864).

Wheat is a true grass, and belongs to the genus *Triticum*. The inflorescence, or ear, is a true grass spike, consisting of spikelets arranged upon a rachis. At the base of each spikelet are two empty, boatlike glumes, within which are from two to eight florets, which when fertile contain one grain or 'berry'

each. Cultivated wheat is an annual, unknown in the wild state; neither is there any grass which can be regarded as its parent form. It has been found in prehistoric lake dwellings, and was cultivated by the ancient Chinese and Egyptians. The Romans introduced it into Britain. The origin of wheat is discussed in Darwin's *Animals and Plants under Domestication*. Dr. Candolle inferred that its natural home was Mesopotamia.

A useful arrangement of the various cultivated wheats is as follows:—*Triticum sativum*, common wheat, of which there are numerous varieties; *T. turgidum*, including cone and other turgid wheats; *T. durum*, hard wheat; *T. polonicum*, Polish wheat; *T. amyleum*, starch wheat; *T. monococcum*, a single grain in each floret; *T. spelta*, spelt, said to have been the cultivated wheat of the Romans. Haeckel recognizes only the first, fourth, and sixth of the above as species, and the others as varieties only. *T. sativum* and *T. turgidum* are both cultivated in Great Britain, but the latter in small quantity, chiefly as Rivett's and other cone wheats. The cone wheats are soft and coarse, bearded, and rough-chaffed. They yield heavy crops of both grain and straw, and comprise the so-called 'mummy' wheat. *T. sativum* or *vulgare* is by far the most extensively grown wheat, and has shown itself capable of producing any number of varieties. Major Hallet first drew attention to pedigree cereals. One of the chief economic differences in wheats is evidently the result of climate. The hard wheats of India and of other tropical countries are extremely dry and rich in gluten; whereas the wheats grown in Great Britain and Europe contain rather more moisture, and are richer in starch. These two



Varieties of Wheat.

1. Square heads (naster). 2. *Triticum sativum* (Talavera). 3. *T. monococcum*. 4. *T. compositum* (mummy wheat). 5. *T. spelta*. 6. *T. polonicum*. 7. *T. turgidum*. (Spikelet of each of 2 to 7 shown separately.)

classes of wheat are blended to produce a mellow flour.

Wheat may be cultivated in all latitudes, from the tropics almost to the limits of the temperate zone; but it is best suited for soils of argillaceous character. The yield of wheat per acre varies according to climate and cultivation. In several of the United States an average of only 9 or 10 bushels per acre is looked for. The average yield in France is about 15 bushels, in England 30 bushels, and in Canada from 20 to 40 bushels. Maximum crops in England reach 60 bushels or more in the south-eastern counties.

Wheat, DISEASES OF. See RUST FUNGI, SMUT, HESSIAN FLY.

Wheatear (*Saxicola oenanthe*), one of the chats, is a frequent summer visitor to Britain, where it also occasionally occurs in the winter. The male is grayish blue above, with a black streak at the side of the head, the wings are nearly black, the rump white, the tail black and white, the under surface white, with a tinge of buff. The wheatear has a very characteristic mode of flitting about, when it constantly displays the white rump. The food consists of insects, and the bird is common both on moorlands and near the sea. The nest is placed in a great variety of situations, often in a rabbit-burrow or in a crevice of a stone wall. The song is sweet, and the bird has some power of mimicry. The genus includes not a few other species — e.g. the desert wheatear (*S. deserti*), the black-throated wheatear (*S. stapazina*), and the Isabelline wheatear (*S. isabellina*).

Wheat Fly. See HESSIAN FLY.

Wheatley, urban dist. and par., W. Riding, Yorkshire, England, 2 m. N.E. of Doncaster. Pop. (1911) 5,363.

Wheaton, HENRY (1785-1848), American jurist and diplomatist, born at Providence, Rhode I.; was called to the bar (1805). He edited *The National Advocate* (1812-15); was reporter (1816-27) for the United States Supreme Court; *chargé d'affaires* to Denmark (1827-35); and minister at Berlin (1835-46). Among his works are *A Digest of the Law of Maritime Captures* (1815), *Life of William Pinkney* (1826), *History of the Northmen* (1831), *Elements of International Law* (1836; 4th Eng. ed. 1904), and *History of the Law of Nations in Europe and America* (1845).

Wheatstone, SIR CHARLES (1802-75), English electrician, was born near Gloucester. His first researches were in connection with sound. In 1834 he became professor of experimental philosophy at King's College, London, and in 1837 took out patents for an instrument for giving signals by electricity, which has grown into the telegraph. In 1838 he invented the stereoscope, and in 1843 instruments for measuring the constants of a voltaic series. Wheatstone's bridge for measuring electrical resistance he did not invent, but only brought into public notice. His *Scientific Papers* were published in 1879.

Wheatstone Bridge. See ELECTRIC TESTING.

Wheel and Axle. This consists of a wheel secured to a coaxial shaft. When this simple machine is used for raising heavy weights, the string supporting the load is wrapped round the axle, whilst that by which the power is applied is coiled round the wheel. (Fig. 1.) If assumed frictionless, the principle is shown by applying the equation of work. Let P and W be the effort and the load respectively, and let R and r be radii of the wheel and of the axle, and

imagine one complete turn to be given. W rises a distance $2\pi r$,

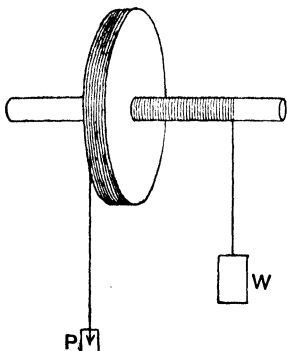


FIG. 1.

and P descends $2\pi R$; hence $PR = wr$. If pounds and feet be the units, this equation repre-

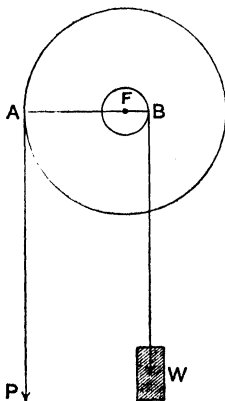


FIG. 2.

sents moments, expressed in pound-feet. By considering the

end elevation (Fig. 2) it is easily seen that the machine behaves as if it were a lever AB of the first class turning about F . Hence $P \times AF = W \times FB$, or $P \times R = W \times r$. If the wheel be replaced by a handle, the machine becomes a windlass; the addition of a jib and stay and a little extra gearing make it into a crane.

Wheel Animalcules. See ROTIFERA.

Wheel Base, the distance between centres, from extreme front to extreme back wheel, of locomotive or car.

Wheeler, JOSEPH (1836-1906), American general, born at Augusta, Georgia. He served through the civil war on the Confederate side; commanded the cavalry division in Cuba, and was prominent in the capture of Santiago (1898), negotiating the surrender of the Spanish army. He saw further service in the Philippines (1899-1900), and became brigadier-general (1900). He wrote *Cavalry Tactics* (1863); *Account of Kentucky Campaign* (1862); *History of the Santiago Campaign* (1898); *History of Cuba, 1493-1899* (1899); *History of the Effect upon Civilization of the Wars of the 19th Century*; and *Lives of Dewey, M'Kinley, Stonewall Jackson, and Roosevelt*.

Wheeler, WILLIAM ALMON (1819-87), American legislator and vice-president of the United States 1877-81, was born at Malone, New York, and called to the bar in 1845. He occupied a seat in Congress for New York, from 1869-1877. He will be remembered for 'the Wheeler Compromise' (1875), whereby the government of Louisiana was settled. He was nominated to serve with President Hayes by the Republican party (1877-81).

Wheeling, city, W. Virginia, U.S.A., co. seat of Ohio co., 47 m. s.w. of Pittsburg, on the Ohio; manufactures principally iron,

steel, tin, glass, pottery, and tobacco. Pop. (1910) 41,641.

Wheel-lock. See GUNS.

Wheels, REACTION, PELTON, WATER. See HYDRAULIC MACHINERY.

Whelk, a name applied to a number of marine carnivorous gastropods, though it should be restricted to the species of *Buccinum* and *Fusus*. The common whelk of British waters is *B. undatum*, called 'buckie' in Scotland, which burrows in mud and sand from low water to considerable depths. It is both used as bait and sent to the London market for food. The shell has few whorls, is spirally grooved and striated, and has the surface marked with oblique transverse undulations. Allied to *Buccinum* is the genus *Fusus*, including the forms called spindle-shells, red whelks, or roaring buckies, which have markedly fusiform shells. The dog-whelk is the common *Purpura lapillus*, abundant everywhere between tide-marks; and the name is also applied to species of *Nassa*, of which *N. reticulata* occurs between tide-marks in abundance.

Whetstones. See HONES.

Whewell, WILLIAM (1794-1866), English philosopher, was born at Lancaster; graduated (1816) as second wrangler at Cambridge, and became a fellow of Trinity College. In 1828 he became professor of mineralogy, and from 1838-55 held the chair of moral theology. In 1841 he was elected master of Trinity, and in 1855 vice-chancellor of the university. His activity as a lecturer, preacher, writer, and administrator was prodigious, and his scope was enormous. 'Science,' said Sydney Smith, 'was his forte, omniscience his foible.' Among his works were *History of the Inductive Sciences* (1837), *The Philosophy of the Inductive Sciences* (1840), *The Elements of Morality*

(1855), and translations of foreign plays, philosophies, law books, and novels. See Todhunter's *Whewell* (1876), and *Life* by Mrs. Douglas (1881).

Why. See CHEESE.

Whitchote, or WHITCHCOTE, BENJAMIN (1609-83), English divine and philosopher, was born in Shropshire, and elected a fellow of Emmanuel College, Cambridge, in 1633. He preached weekly sermons at Trinity Church, through which he exerted a powerful influence on the university for nearly twenty years. He held various livings and academic positions at Cambridge. Whitchote held the views of the Cambridge Platonists or Latitudinarians, who insisted on the supremacy of private judgment, and on the fundamental facts of religion, over the dogmas of Puritan orthodoxy. Among his writings are *Discourses*, in 4 vols. (1701-7), under title *Works* (1751); *Moral and Religious Aphorisms*, edited by Salter (1753). Complete edition of his *Works* (4 vols. 1751), by Campbell and Gerard.

Whickham, urban dist., Durham, England, 4 m. s.w. of Gateshead. It is the centre of a coal-mining district, and has iron, steel, wire, and chemical works, and roperies. Pop. (1911) 18,332.

Whidah. See WHYDAH.

Whig, the designation of a party in English politics, was, like many political names, first applied in derision. It is a shortened form of 'Whigamore,' a term applied to the Covenanting men of the south-west of Scotland (variously derived from *whig*, sour whey, and *whiggam*, a sound made by drivers to urge on their horses). The word seems to have been generally applied after the restoration to the whole Presbyterian party in Scotland, and later in England to all who were suspected of opposition to the king, or of sympathy with the

nonconformists. The term became the designation of the party which made the revolution, and which, through the medium of the great Whig houses, ruled England till the time of George III. At the time of the Reform Act it was supplanted by the term Liberal. It is still used by English Radicals as a term of derision and criticism towards those members of the Liberal party who are not 'advanced' in their views.

In United States politics the term was first applied to the revolutionaries, as Tory was applied to the loyalists, and it was adopted later by the party which organized itself in opposition to the rather high-handed politics of President Jackson. But this new Whig party stood for no definite principles, and its policy of compromise in the face of the great slavery issue brought it into discredit. It was superseded by the Republican party. See Lord Holland's *Memoirs of the Whig Party* (1852-4), *Further Memories, 1807-21* (1906), and *Political History of England*, viii. (1910), and (for American Whigs) *Cambridge Modern History*, vii. *passim* (1903).

Whimbrel. See CURLEW.

Whin. See FURZE.

Whinchat (*Pratincola rubetra*), a near ally of the stonechat, which it generally resembles in colour. It is only a summer visitor to the British Isles, wintering in Africa, and is found chiefly on warm sunny heaths where there is undergrowth, but also in grass meadows, whence its other name of grasschat. The food consists chiefly of insects.

Whinstone, a name popularly applied in Scotland and the north of England to any tough, hard, dark-coloured rock not easily recognizable as a sandstone, a limestone, or a shale. Most of them are coarsely crystalline diabases

or dolerites, or finer-grained porphyritic basalts; others are varieties of andesite, trachyte, or diorite.

Whippet, the result of a cross between the terrier and the Italian greyhound; it varies in weight from 10 lbs. to 25 lbs. It is the favourite dog in the north of England and in Scotland, where it is used for racing. It is also used for coursing rabbits. Points of the whippet:—Head long and lean, rather wide between the eyes and flat on the top; jaw powerful, yet cleanly cut; teeth level and white; eyes bright and fiery; ears small, fine in texture, and rose-shaped; neck long, muscular, elegantly arched, and free from throatiness; shoulders oblique and muscular; chest deep and capacious; back broad and square, rather long and slightly arched over loins, which should be strong and powerful; fore legs rather long, well set under, and with fair bone; hind quarters strong and broad; stifles well bent; thighs muscular; hocks well let down; feet round, well split up, with strong pads; tail long, tapering, and nicely carried; coat fine and close; colour black, red, white, fawn, brindle, blue, and mixtures of the same.

Whipping, a punishment inflicted in former times on persons below the rank of gentlemen for many minor offences, often 'at the cart's tail,' when the offender was tied behind a cart and whipped, while the cart proceeded at a foot's pace from one specified place to another. Thus Titus Oates was sentenced to be whipped from Aldgate to Newgate, and two days later from Newgate to Tyburn. In 1817 the public, and in 1820 the private, whipping of females was abolished. It is still a common-law punishment for male misdemeanants, but is rarely inflicted unless specially provided for by statute.

Under the Vagrancy Act, 1824, incorrigible rogues may be whipped; and under the Offences against the Person Act, 1861, and the Garrotters Act, 1863, a male person convicted of robbery with violence, or of garrotting with intent, may be once, twice, or thrice whipped with twenty-five strokes of a birch rod if under sixteen, or with fifty strokes of any other instrument if over that age. Males under sixteen may be whipped for incest, larceny, arson, and certain other offences under the Offences against the Person Act, 1861, the Malicious Damage Act, 1861, and the Criminal Law Amendment Act, 1885. By the Whipping Act, 1862, which applies to the United Kingdom, an offender sentenced to whipping may not receive more than twelve strokes of the birch rod if under fourteen, nor may any offender be whipped more than once; and in Scotland no person above sixteen may be whipped for offences against person or property. By the Naval Discipline Act, 1866, seamen in the royal navy may be sentenced to forty-eight lashes, but no petty or non-commissioned officer may be so sentenced except for mutiny. Boys under eighteen may be caned or birched; but the practice has recently been suspended by the Admiralty for a year, as an experiment. Under the Prisons Act, 1898, in civil and military prisons corporal punishment may be ordered in cases of mutiny, but only on special inquiry.

Whippingham, par. and vil., Isle of Wight, England, 2 m. s.s.e. of Cowes. The church of St. Mildred contains memorials to Queen Victoria, the Prince Consort, Prince Leopold, and Princess Alice. Osborne House is in the parish. Pop. 850.

Whip-poor-will (*Antrostomus vociferus*), a North American

night-jar, receiving its name from its cry, which is loud and clear, and heard only at night. The bird is about ten inches long, and in appearance and habits resembles the other nightjars. The bristles at the base of the bill are an inch long and very stiff, and there is a narrow white collar, while the lateral feathers of the rounded tail are largely white. Farther to the south the whip-poor-will is replaced by another species called chuck-will's-widow (*A. carolinensis*).

Whip-snake. See DRYOPHIS.

Whirlpool, an eddy or vortex, produced by the meeting of two or more currents of water. Such phenomena are frequent along broken coasts and among islands. Poe's famous tale of the Maelstrom is pure imagination. The Maelstrom is simply a strong current off the coast of Norway, which becomes dangerous to small craft during the north-west winds of autumn and winter. Similarly, Charybdis was nothing more than a current which became dangerously strong under certain conditions of wind and tide.

Whirlwind, a mass of air whose elevation is very much greater than its width, and which rotates rapidly round a more or less vertical axis. It is a purely local phenomenon, and does not last long. Whirlwinds usually spring up about ten or eleven o'clock in the morning, when the ground has been warmed by the solar rays. The lower air begins to ascend. As the inflowing currents move through too limited a space to be influenced by the earth's rotation, and as the irregularity of their flow prevents them from meeting at a common centre, they deviate a little to one side or the other, and a small gyrating column is developed. This may rise eventually to a height of several hundred or even a thousand feet.

At this elevation it spreads out laterally, and the supply of warm air being soon exhausted, the whirl quickly disappears. The dimensions are very variable, ranging from a harmless eddy in a dusty road to the terrific tornado of the United States. Whirlwinds are rarely experienced in the British Isles. One of the most destructive was that which passed over part of Kent, between Walmer and Deal, on Oct. 24, 1878, known as the 'Walmer whirlwind.' See Symon's *Monthly Meteorological Magazine*, vol. xiii.

Whisky, a grain spirit obtained from malted barley or other cereal. (For malting and brewing, see BREWING.) Peat fires are often used in the Scotch kilns for drying and curing the malt; hence the peat flavour of some Highland and west country whiskies. After mashing, the wort is drained off from the draff, or spent grains, into an under-back, and allowed to settle for a short time, then cooled as rapidly as possible to about 70° F. to prevent it from becoming 'blinked' or soured. The wort contains carbohydrates, ash, albuminoids; it must therefore be quickly pitched with yeast, otherwise bacterial action may set in, and hinder a successful alcoholic fermentation. When fermentation is over, the resultant alcoholic liquid is termed 'wash.' The distiller aims at obtaining a wash of as low a gravity as possible—it generally runs about 1'004. The object of distilling the wash is to separate bodies which assume the form of vapour at a low temperature from those which require a higher, or from such as do not vaporize.

It is necessary to distinguish between genuine whisky made by pot stills and grain whisky made by patent stills, such as the 'coffey,' in which the whisky

is so pure as not to betray the origin of the spirit. Much of the ordinary whisky of commerce is a blend composed of a small quantity of pot-still whisky and a large quantity of the patent-still spirit. The pot-still consists of a copper still or kettle, fitted with a pear-shaped head or capital, with or without a fractionating apparatus, and a copper worm which runs through a large tub of cold water. The first or wash still has a capacity of from 4,000 to 7,000 gallons, while the inside is furnished with a mechanical stirrer, in order to prevent the solid particles from charring on the bottom. The second or spirit stills average from 2,000 to 3,500 gallons. The wash is drained from the covered fermenting vats into a wash charger, and from this into the wash stills. A small quantity of tallow, rectified paraffin, or other body, is added to prevent frothing, and the distillation is started. The first product obtained is a weak alcoholic liquid known as 'low wines,' or 'singlings.' These as vapours usually pass through a charcoal-box, and thence into the condensing apparatus. The residue, spoken of as 'pot' or 'burnt ale,' is run to waste. It contains about 3 per cent. of solids. The low wines are run into the spirit stills, and again subjected to distillation. The products of this second distillation are foreshots, clean spirit or whisky, and feints; while left in the still are the 'spent lees,' which also are run to waste. The foreshots and feints both give a milkiness when diluted with an equal volume of water. These are mixed with the next low wines and again distilled. Milkiness in the foreshots is caused by oily matter, and in the feints by the higher alcohols or fusel oils. Thus pot-still whisky must

contain some small quantity of these bodies. The fusel oils, acids, esters, and furfural confer on this spirit its characteristics, and in the new whisky they cause the harsh, fiery, raw, and disagreeable flavour. The strength of pot-still whisky varies between 13° and 50° overproof (O.P.). In Scotland this is reduced to a uniform level of 11° O.P. before bonding, while Irish whisky is bonded at 25° O.P. One hundred volumes of the Scotch spirit will contain 111 volumes of proof spirit, and 100 of the Irish will have 125 of proof spirit. Whisky, like brandy and rum, must not be retailed at a strength lower than 25° underproof (U.P.)—*i.e.* 100 volumes of the spirit must contain not less than 75 volumes of proof spirit.

The objects in using a patent still are a rapid distillation, and the production by one operation of a pure spirit. In these stills the analyzer separates the spirit, water, oils, and other volatile bodies from the wash, while the rectifier separates the spirits and aldehydes from the water and oils. The so-called 'silent spirit' obtained from patent stills varies but little in strength, the average being from 65° to 67° O.P. The new spirit thus produced is a colourless, mobile liquid, closely resembling spirits of wine in appearance. It possesses a disagreeable and often very nauseous flavour; but this disappears on storage in sherry casks for several years, or on being judiciously blended with other spirit. The specific gravity varies between 0·9148 and 0·9288; the amount of alcohol from 47 to 60 per cent. Total extract should always be under 1 per cent. The chief adulterant is potato spirit, containing much fusel oil. This, if present to a greater extent than 1·5 grains

per fluid ounce, is highly injurious to health.

During storage there is a considerable loss of spirit, especially in damp bonded stores. In the first year it amounts to 2·25 per cent. of proof spirit, in three years to 4 per cent., and in five years to 7·5 per cent. The improvement by 'ageing' continues for a number of years. There are several patent processes for 'ageing,' but none are so effective as time.

Potheen, or potteen, is made in illicit stills—much of it from sugar and fermented molasses. Irish pot-still whisky is usually obtained from a mixed grist of malt and raw grain; grain whisky, from a mixed grist of barley, rye, maize, wheat, etc., and is a patent-still product. English whisky is a patent-still spirit, in which a small quantity only of malt is used. The grist is malted rye, ground oats, and maize. German whisky is also a patent-still spirit, in the preparation of which some forty-six different starchy materials are used.

Whisky Insurrection. (1.)

An outbreak in Western Pennsylvania in 1794, caused by an attempt on the part of the United States government to enforce the excise law (imposing taxes on distilled liquors) enacted by Congress (1791). (2.) Also an attempt made (1873-4) by the women of Southern Ohio and New York to prevent the sale of liquor.

Whist, a game of cards which originated in the 16th-century English game of triumph—corrupted into 'trump.' At the beginning of the 17th century it was known also as 'ruff' and 'honours,' and shortly afterwards as 'whisk' or 'whisk and swobbers.' Thirty or forty years later it assumed its present title of 'whist,' a term signify-

ing 'silence.' Its practice was originally confined to the disreputable classes, but about the year 1730 it was taken up by a party of gentlemen, headed by Lord Folkestone, who met at the Crown Coffee House in Bedford Row, London, and they, with the aid of Edmund Hoyle, who gave lessons on the game, introduced it into fashionable society. Hoyle was the father of scientific whist, and published his *Short Treatise* in 1742. Before his time the game was played nine points up; but he introduced the ten score, or long whist. It was in the early years of the 19th century that short whist, or the cutting down of the winning score from ten to five, came into vogue. The evolution of whist into a highly philosophical game took place in the decade following 1860, and was due to the labours of Henry Jones ('Cavendish'), James Clay, M.P., and Dr. Pole. The first edition of *Cavendish on Whist* appeared in 1862, and two years later Clay produced his *Treatise on Short Whist*. American whist (known as straight whist) differs in one or two particulars from the English form. Rubbers are not played, honours are not reckoned, and the winning score consists of seven up in the clubs and tournaments, and, as a rule, five up in private circles. Duplicate whist, or the replaying of the same series of games with the cards of the respective sides exchanged, has obtained an immense popularity in America.

Whist is a game for four persons, two of whom are partners against the other two, each player sitting opposite to his partner. The partnership is determined by cutting from the pack, the two highest playing against the two lowest—ace counts lowest in cutting—and the person cutting lowest has

the deal. The cards, after being shuffled by the dealer, are cut by the adversary on his right; the dealer then reunites the pack and deals it out, the last card being turned up to denote which suit is trumps. If a player can follow suit he must do so, otherwise he may trump (or 'ruff' as it is sometimes termed), or may throw away any card he pleases. The latter is called 'discarding.' To fail to follow suit when you hold cards in it is known as 'revoking,' and for this irregularity the adversaries can deduct three tricks from the revoking side or add three points to their own trick score. The object of the game is for one side to score five points before the other side can do so. There are thirteen tricks to be made in each deal, and when two partners win more than six of these, every trick above six counts as an overtrick to the side making it, and the other side—except perhaps in honours—scores none. Five points constitute a game. There are four honours—viz. ace, king, queen, and knave of the trumpsuit. When two partners hold the four, individually or between them, they score four points. When they hold three honours, they score two points; and when the honours are divided equally between the two sides, they are not counted. Overtricks take precedence of honours in scoring. A side standing at four cannot score honours.

Whist is played in rubbers. A rubber consists of the best two out of three games. When a side wins two games in succession, the third game is not played. The stakes at English whist are fixed at so much per rubber point, which must not be confused with trick points. For winning the rubber two points are taken. For every game won when the adversaries have not scored at all a 'treble,'

or three points, is taken; when the losers have scored less than three overtricks, a 'double,' or two points, is taken; and when the losers score three or four overtricks, the winners take a 'single,' or one point. When the losers of a rubber have won a game, the rubber points they have made on it are deducted from the gross rubber points of the other side.

You should always open the game by leading your longest and strongest suit, even if it be one of only four cards as against three in each of the remaining suits; for if the balance of your four-card suit be equally divided among the other players, and three rounds be played, your fourth card becomes the thirteenth and best, and when you lead it will either take the trick or force a trump. When you have five or six cards of a suit, your prospects of creating best cards are correspondingly greater; but you are not likely to make tricks with them unless all the adverse trumps have been previously drawn. A player with a preponderating run of trumps is able by playing them to draw the inferior or force the better ones, and still retain one or two to stop the run of an adversary's plain suit, or to bring in his own or that of his partner. You consequently endeavour to preserve a strong trump hand intact.

The first hand, as has been said, leads his longest and strongest suit. If he has the best cards, he continues playing them until he has reason to believe that the other side has no more of the suit and is likely to ruff it. When he opens from high honours in sequence, but not the best—such as king, queen, knave or queen, knave, ten—he plays the highest as information to his partner, and to force the better card or cards out of the way should they be with the adver-

saries; but with a single honour, or two honours not in sequence, or no honours at all, he leads his fourth best, except in the case of a suit headed by a king, knave, ten, when he leads the ten. Another exception is from ace and four or more small cards, when ace is led first, as holding it back involves the risk of getting it trumped on in a later round; or with ace only, you lead it off at once, as otherwise you may be compelled to cover your partner's king should he play before you. When your partner opens a suit with the fourth best and subsequently drops a lower card, it is obvious that he originally held at least five of the suit. When third hand has to cover the trick, he does so with his best card, unless he has ace and queen, when he finessees the queen on the first round and plays the ace when he returns the suit; but except with ace and queen, he is seldom justified in finessing on a partner's lead of a low card. From ace, king, or king, queen, lead the king. If it goes home, and your partner does not hold the ace, he knows you have it; but if he has it himself, or an adversary takes the king with it, he knows you have the queen. With king, queen, knave, ten, however, you lead the ten; for if your partner has the ace, you want him to put it on and clear the suit for you. When you lead an honour other than the best and it takes the trick, you continue with your lowest of the suit. Second hand, as a rule, plays his lowest to the trick, unless a high card is led and he has two higher in sequence, when he covers with the lower of the two; or if he has ace, without other high cards, and an honour is led, he puts on the ace. By holding up his best cards he governs, to a certain extent, the strong leading hand.

When fourth player takes the trick, he returns his own or his partner's suit, or plays trumps if his partner has shown that he wants them. When a player does not cover the trick he plays his lowest card. In leading a trick of a sequence play your highest; in covering a trick with a card of a sequence, your lowest, so that if you put the king on the jack, your partner knows for certain that you do not hold the queen. When holding five or more trumps, it is generally advisable to lead them, even if the rest of your cards are poor, for you clear the ground for any possibilities your partner may have in the plain suits. The method of signalling to your partner that you want trumps out is by playing to the current trick an unnecessarily high card, and to a later trick a lower one of the same suit—a three followed by the deuce will serve the purpose. When the adversaries are cross-ruffing, lead trumps at once, even if you have only one, and lead trumps from similar weakness when you have a really fine all-round hand in the plain suits, but first show your best suit by playing a master card for one round. With weak trumps ruff a doubtful trick unhesitatingly, but with a strong trump hand give your partner the chance to win the trick. It is sometimes necessary to abstain from trumping even a certain trick, as when, for instance, you have the four best trumps and the whole command of a long suit. The fact that you want trumps out ought in such a case to be patent to your partner. Carefully note your partner's discard when he refuses to ruff. It comes from his weak suit. When he throws off a best card, it necessarily comes from his strong one.

In returning a partner's suit

play back the winning card if you have it, otherwise lowest from three or more remaining, highest from two only, so that when you afterwards show a higher card than the one you returned, he knows you originally held at least four in suit. In opening a short weak suit lead your highest, as if it happens to be your partner's strong one it may help him. Let your first discard be from your weakest suit, unless trumps are declared against you, when you discard from your best protected suit and preserve the weak suits—which are doubtless the enemy's strong ones—to block his run in them. If you have the entire command of a suit, throw off the best card to show your partner that you have a sequence of the next best. Do not unguard an honour or bare an ace. Retain command of the adversaries' best suits by holding up master cards in them; but play off best cards in your partner's suits, and so vest the command with him.

Dummy Whist is the four-handed game played by three instead of four persons. One hand, which is called the dummy, lies exposed on the table, and throughout the rubber the person sitting opposite plays it in co-operation with his own hand. The laws are the same as those of whist, with the following exceptions:—(1.) Dummy deals at the commencement of every rubber. (2.) Dummy's hand is not liable for a revoke, and should one occur, and the trick be turned and quitted without protest, it stands good. (3.) Dummy being blind and deaf, its partner is not liable should he commit an irregularity from which he cannot derive advantage, such, for instance, as by exposing his cards, or by commenting on their character or on the state of the game.

Double Dummy is played by

two persons, each having a dummy or exposed hand for his partner. The laws are the same as those of dummy whist, save that there is no misdeal, the deal being a disadvantage. See *The Principles and Practice of Whist*, by Lennard Leigh and Ernest Bergholt (1902); *Modern Scientific Whist* (ed. 1902), by C. P. D. Hamilton; *Laws and Principles of Whist* (1895), by 'Cavendish'; and *How to Play Whist* (1885), by Proctor.

Whistler, JAMES ABBOT M'NEILL (1834-1903), American impressionist painter, etcher, and lithographer. Born at Lowell, Massachusetts, he entered the studio of Gleyre in Paris. His first painting, *The White Girl*, was exhibited at the famous Salon des Refusés. In 1859 he settled in Chelsea, and was the first to discover the artistic possibilities of that reach of the Thames. He exhibited frequently at Burlington House, until his magnificent *Portrait of my Mother* (Luxembourg at Paris) found one advocate only among the hanging committee of the year; it was, however, awarded the gold medal by the Salon of 1884, and bought by the French government. The equally fine *Portrait of Carlyle* is in Glasgow. Thereafter he exhibited regularly in the Grosvenor Gallery from 1877. In 1878 occurred the famous libel suit against Ruskin for criticising him in *Fors Clavigera*. Two series of *Notes, Harmonies, and Nocturnes*, signed with the mark of the butterfly, were hung in the Fine Art Society's Galleries in 1884 and 1886. For many years he resided in Paris and founded a school. In 1884 he was elected a member of the Society of British Artists, and president in 1886. He is author of *Ten o'Clock*, a lecture (1885), included in *The Gentle Art of Making Enemies* (1890); *The Butterfly and the*

Baronet. The British Museum has a collection of his etchings. See 'Whistler,' in *Fifty Years of Art* (Art Journal publication, 1900); Whistler monograph, published by the Société de l'Art Independent, Paris; Way and Dennis's *The Art of J. M'Neill Whistler* (1904); Eddy's *Recollections and Impressions of Whistler* (1904); Singer's *J. M'N. Whistler* (1905); and E. R. and J. Pennell's *Life of Whistler* (new ed. 1911).

Whiston, WILLIAM (1667-1752), English divine and mathematician, was born at Norton, Leicestershire; received a fellowship at Clare College, Cambridge (1693). In 1696 he published a *New Theory of the Earth*. In 1701 he became deputy, and in 1703 successor, to Newton in the Lucasian professorship of mathematics at Cambridge; but an essay on the *Apostolical Constitutions*, and a denial of the doctrine of the Trinity as generally received, led to his removal from the professorship in 1710. In 1711 he published *Primitive Christianity Revived* (embodying the essay mentioned above). In 1730 he published a *Life of Samuel Clark*, and in 1736 a translation of *Josephus*. See *Memoirs* by himself (1749 and 1753).

Whitaker, JOSEPH (1820-95), English publisher, was born in London. In 1855 he commenced business on his own account as a theological bookseller, and became known as the publisher of the *Artist*, and later (1858) of the *Bookseller*, and afterwards as editor of the *Gentleman's Magazine*. The publication which has made his name a household word is *Whitaker's Almanac*, which was started in 1868. In 1874 he issued his *Reference Catalogue of Current Literature*, which is periodically reissued (new ed. 1906).

Whitbread, SAMUEL (1758-1815), English politician, born in London. In 1790 he entered

Parliament as member for Bedford in the Whig interest. He became a partisan of Fox, vigorously identifying himself at the same time with every movement towards emancipation and reform. He was throughout a strenuous advocate of peace; and from 1812 till his death he constituted himself the champion of Caroline, Princess of Wales. He committed suicide while mentally deranged. See Hone's *Tributes of the Public Press to . . . Mr. Whitbread* (1815); also Le Marchant's *Life of Earl Spencer* (with biography of Whitbread, pp. 172-180).

Whitburn. (1.) Parish and vil., Durham, England, 3 m. N. of Sunderland. The village is frequented for sea-bathing. Pop. 3,300. (2.) Parish and tn., Linlithgowshire, Scotland, 3 m. s.w. of Bathgate. Coal and iron abound in the parish. Pop. (1911) par. 4,455; tn. 1,875.

Whitby. (1.) Town, N. Riding, Yorkshire, England, at mouth of Esk, 40 m. N.E. of York. It is a fashionable resort, the best part of the town being West Cliff. The mouth of the river is sheltered by two piers; West Pier, over 1,000 ft. long, affords a fine promenade. The church of St. Mary is an ancient structure, on a rocky platform, reached by 199 steps; and near it are the ruins of Whitby abbey, originally founded in 658, destroyed by the Danes in the 9th century, and rebuilt soon after the conquest. In the old monastery died, in 680, the poet Caedmon, to whose memory a handsome Saxon cross was erected in the old churchyard in 1898. The characteristic industry of Whitby is the manufacture of jet ornaments. Fishing and boat-building are also carried on. Pop. (1911) 11,139. (2.) Town, Ontario, Canada, co. seat of Ontario co., on Lake Ontario, 30 m. N.E. of Toronto. Pop. 2,300.

Whitchurch. (1.) Urban dist. and mkt. tn., Shropshire, England, 19 m. N. of Shrewsbury, with malting and large cheese fairs. The church of St. Alkmund contains interesting monuments. Pop. (1911) 5,757. (2.) Parish and tn., Hampshire, England, 7 m. E. by N. of Andover. There is a large trade in agricultural produce. Pop. (1911) rural dist. 1,935. (3.) Parish and vil., Glamorgan, Wales, on the riv. Taff, 1 m. N. of Llandaff; has large iron and tin works. Pop. 4,850.

White, ANDREW DICKSON (1832), American statesman and author, born at Homer, New York. After being *attaché* at the United States legation at St. Petersburg, he was professor of history at Michigan University (1857-63). He is, however, best known for his connection with Cornell University, of which he was president (1866-85). At the same time he was United States commissioner to Santo Domingo (1871), and minister at Berlin (1879-81); United States ambassador at St. Petersburg (1892-4); a member of the Venezuela Boundary Commission (1895-6); ambassador to Germany (1897-1903); and a member of the Hague Peace Conference (1899). His best-known works are *The Warfare of Science with Theology* (1897) and *Seven Great Statesmen in the Warfare of Humanity with Unreason* (1910). See his *Autobiography* (1905).

White, SIR GEORGE STUART (1835), British field-marshal, born in County Antrim, Ireland, and first saw service in the Indian mutiny (1857-8). He served throughout the Afghan campaign (1878-80), and won the Victoria Cross at Charasiab (Oct. 6, 1879) and Kandahar (September 1880). In 1884-5 he was with the Nile expedition, and in 1886-9 he commanded the forces in Burma. In

1893 he succeeded Lord Roberts as commander-in-chief of the Indian army (1893-8). When the South African war broke out he was given the command of the Natal field force. He was shut up in Ladysmith on Nov. 2, 1899, and was not relieved until Feb. 28, 1900. Sir George White was promoted general and made G.C.M.G. (1900). He was appointed governor of Gibraltar (1900-4), and in 1905-6 sat on the War Stores Commission. Since 1904 he has been governor of the Royal Hospital, Chelsea. He received a baronetcy in 1904.

White, GILBERT (1720-93), English naturalist, was born at Selborne. He became a fellow of Oriel College, Oxford, in 1752. After holding the living of Moreton Pinkney, he settled at Selborne (Hants) in 1751. Here he spent the remainder of his life, occupied in the observation of nature, the result being the *Natural History of Selborne*, projected in 1771 and finished in 1789, which is rather a collection of notes, anecdotes, and letters, than a systematized treatise on the subject. The best reprint is that edited by Thomas Bell (1877), occupier of White's house at Selborne. An edition by Dr. Bowdler Sharpe (1899) contains White's *Garden Calendar*, edited by Dean Hole. Appended to the *Natural History* is an account of the *Antiquities of Selborne*, in the preparation of which White received the assistance of Richard Chandler. See articles in *Notes and Queries* (1877-8); *Temple Bar* (April 1878); *Macmillan's Magazine* (July 1893); *Bibliography of Gilbert White*, by E. A. Martin (1897).

White, HENRY KIRKE (1785-1806), English poet, was born at Nottingham. In 1803 he published a volume of verse, *Clifton Grove . . . with other Poems* (1803), which attracted the notice

of Southey. White died whilst at Cambridge. His mind was tinged with strong religious fervour. His *Remains* were edited by Southey (2 vols. 1807), with *Memoir*. See also Godfrey and Ward's *The Homes and Haunts of Henry Kirke White* (1908).

White, HUGH LAWSON (1773-1840), American jurist and statesman, born in Iredell co., North Carolina; became, successively, United States district attorney at Knoxville (1807) where he practised, judge of the supreme court (1801-7 and 1809-15), and state senator (1807 and 1817). He also acted as a commissioner to adjust the claims of Spain against the United States (1820), and was a senator (1825-35 and 1836-40). See *Memoir* by Nancy N. Scott (1836).

White, JOSEPH BLANCO (1775-1841), author, was born at Seville in Spain, of Irish descent. He was educated for the priesthood, but in 1810 finally left the Roman Catholic Church and came to England. Here he edited *El Español*, a Spanish periodical (1810-14), till he went to Oxford. In 1815 he accepted the tutorship of Lord Holland's son. His *Practical and Internal Evidence against Catholicism* (1825) won him a name as a defender of the church. In 1826 he returned to Oxford, where he became a friend of Newman, Pusey, and especially Whateley, with whom he lived at Dublin (1832-5) till, on becoming a Unitarian, he left Dublin to pass the rest of his days at Liverpool. Among his works are *Letters from Spain*, by Doblado (1822 and 1825); *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols. 1833); *Observations on Heresy and Orthodoxy* (1835); *Autobiography*, edited by Thom (3 vols. 1845). He is best known as the author of a sonnet on *Night and Death* (1828).

White, MAUDE VALÉRIE (1856), French pianist, born at Dieppe; is also the composer and author of many popular songs, such as *Absent yet Present*, *O were my Love yon Lilac fair*, *The Sea hath its Pearls*, *To Blossoms*. She gained the Mendelssohn scholarship at the Royal Academy in 1879.

White, RICHARD GRANT (1821-85), American Shakespearean editor, born in New York; was from 1853 to the day of his death engaged in the study of Shakespeare and his period. From 1857 to 1865 his edition of *Shakespeare* was in process of publication; it is the best American edition of the great dramatist's works. During his later years (1858-78) he was employed in the United States Revenue Marine Bureau. The most notable of his other works are *Shakespeare's Scholar* (1854), *Memoirs of William Shakespeare* (1865), *Studies in Shakespeare* (1885), *Words and their Uses, Past and Present* (1870), *Every-day English* (1880), and *English Without and Within* (1881).

White, SIR WILLIAM ARTHUR (1824-91), British diplomatist, was born in Poland, and from 1864 to 1875 was consul at Danzig. He was then transferred to Servia as consul-general; in 1878 was appointed envoy-extraordinary to Roumania, and in 1885 at Constantinople. In 1886 he became ambassador-extraordinary at Constantinople.

White, WILLIAM HALE (c. 1830), English writer, known under the pseudonym of MARK RUTHERFORD; was born at Bedford. He has published *The Autobiography of Mark Rutherford* (1881), *Mark Rutherford's Deliverance* (1885), *The Revolution in Tanner's Lane* (1887), *Miriam's Schooling* (1890), *Catherine Furze* (1894), *Clara Hopgood* (1896), *Pages from a Journal* (1900),

John Bunyan (1904), *More Pages from a Journal* (1910), and edited *Johnson's Rambler* (1907).

White, SIR WILLIAM HENRY (1845), British naval architect, born at Devonport; was professor of naval architecture at the Royal School and the Royal Naval College (1870-81), and director of the warship building department of Armstrong and Co. at Elswick, on the Tyne (1883-5), which position he resigned on his appointment as director of naval construction and assistant controller of the royal navy, a post which he occupied till 1902. In 1911 he received the 'John Fritz' medal for notable achievements in naval architecture, the highest distinction which American engineers can bestow. He is the author of *A Manual of Naval Architecture* (5th ed. 1900). He was knighted in 1895.

Whitebait, the young of the herring and the sprat. The whitebait fishery is especially carried on in the estuary of the Thames from February to August. Whitebait consists chiefly of young sprats in the early part of the season, the percentage of herring gradually increasing, until in June they are largely in excess, and afterwards decreasing, until in August the two fish are in approximately equal proportions. Whitebait are also taken in the estuary of the Forth and elsewhere. The fish are taken in stow nets or bag nets. In the early part of the 19th century the British cabinet ministers used regularly to go to Greenwich at the end of the session and take together a 'whitebait dinner.' The custom was revived by Disraeli in 1874, but has fallen into desuetude.

White Beer, or **WEISS BIER**, a whitish, pale-coloured beer, possessing a tart or acid taste. It is a top-fermentation beverage, produced from a mixed grist of

barley and wheat malts, or these with some sugars, and a water containing both gypsum and common salt. In certain places the worts are boiled, but generally they are unboiled; hence their turbidity. The quantities of hops vary from 2 to 2½ lbs. per quarter of malt used. The American white beers are much inferior to the European, the most noted of which are those of Berlin. Alcohol varies from 1·0 to 3·5 per cent. by weight.

Whiteboys. See IRELAND—*History*.

White Caps. See VIGILANCE SOCIETIES.

Whitechapel, one of the poorer 'east-end' districts of London, included in the metropolitan borough of Stepney, notorious during 1888-9 for a series of mysterious murders.

Whitefield, or STAND, residential dist., 5 m. N.W. of Manchester, Lancashire, England. Pop. (1911) 6,967.

Whitefield, GEORGE (1714-70), one of the early leaders of Methodism, was born at Gloucester. At Oxford he came under the influence of the Wesleys, and formally joined the Methodists in 1735. After his ordination he preached with great success in several of the larger English towns and in London. In the year 1738 he sailed to join Wesley in carrying on a mission in Georgia, but returned to England in the same year, with a view to collecting funds for a projected orphanage in Georgia, the support and development of which became one of the great objects of his life. This tour was followed by six other visits to America, the last in 1769-70. Denied the use of their pulpits by the main body of the clergy, he held services in the open air, and often attracted audiences estimated at twenty thousand. Going to Scotland (1741), on the

invitation of Ralph and Ebenezer Erskine, he travelled through the country preaching. A second tour in Scotland in 1742 resulted in a remarkable revival at Cambuslang, Lanarkshire. Early in 1741 a breach occurred between Wesley and Whitefield, the latter holding the Calvinistic doctrine of predestination, and Wesley the Arminian view. A personal reconciliation took place shortly afterwards, but the followers of Whitefield built for him the 'Tabernacle' in Moorfields, London. His *Works*, edited by John Gillies (6 vols. 1771-2), contain chiefly sermons. Whitefield owed his unexampled success as a preacher to his great dramatic talent, his eloquence, and his powerful and sympathetic voice. See *Life* by Tyerman (2 vols. 1876) and by Gledstone (2nd ed. 1901).

Whitefish, a name given (1) to the American species of the genus *Coregonus*, and (2) to the members of the genus *Leuciscus* (i.e. minnow, roach, and dace). The term is also applied to such fish as cod, haddock, whiting, etc., as distinguished from *oily* fish like herring, mackerel, salmon, etc.

White Flag. Except when obviously intended as a flag of truce, the raising of a white flag in warfare is universally accepted as a token of surrender. Any officer or private in the British army displaying the white flag, or other token of surrender, is liable to be tried by general court-martial, and sentenced to death.

Whitehall, a former royal palace, London, England. It was a residence of royalty from 1530 until 1697, when it was destroyed by fire. In front of Whitehall Charles I. was beheaded in 1649. It now houses several public offices, including the Treasury, Horse Guards, Admiralty, and War Office.

Whitehall, tn., Washington co., New York, U.S.A., 60 m. N. by E. of Troy. Silk, lumber, etc., are manufactured, and there are railway workshops. Pop. (1910) 5,869.

Whitehaven, munic. and parl. bor. and seapt., Cumberland, England, 7 m. s. of Workington. It has collieries, deposits of hæmatite iron ore, engineering works, shipbuilding yards, and breweries. Pop. (1911) 19,048.

White Head, maritime vil. of Guysborough co., Nova Scotia, Canada, on the Atlantic coast, 20 m. E.S.E. of Guysborough. This is the first land on the Nova Scotia coast seen by vessels coming from Europe.

Whitehead, CHARLES (1804-62), English poet and novelist, was born in London, and in 1831 published *The Solitary*, a poem of real imaginative power. The humorous *Autobiography of Jack Ketch* (1834) led indirectly to the production of the *Pickwick Papers* by Dickens. *Richard Savage*, a novel, and Whitehead's best work, appeared in 1842, with illustrations by Leech (new ed. 1896). A victim to intemperance, Whitehead went to Australia in 1857, and died in great want. *The Solitary*, and other *Poems* (1849) embodies Whitehead's collected poetical works. *Smiles and Tears* (collected stories) appeared in 1847, and a *Life of Sir Walter Raleigh* in 1854. See *Charles Whitehead*, by Mackenzie Bell (1884).

Whitehead, SIR JAMES (1834), English philanthropist, born at Appleby, Westmorland; was an alderman of the city of London (1882-96), sheriff (1884), lord mayor (1889), and member of Parliament for Leicester (1892-4). He mediated in and settled the great dock strike (1889), and is known as the founder of the penny-a-week collection for the metropolitan hospitals, and of the

Rowland Hill Benevolent Fund in aid of post-office servants.

Whitehead, PAUL (1710-74), English political satirist, was born in London; he was thrown into the Fleet for a debt for which he had offered security. In 1733 he published a poetical satire, *State Dunces*, and another, *Manners*, in 1739. He became a member of Sir Francis Dashwood's infamous brotherhood of Medmenham Abbey, and as such was attacked by Churchill in his satires. Other satires by Whitehead are the *Gymnasiad* (1744) and *Honour* (1747). His *Poems and Miscellaneous Compositions*, edited by Thomson, with *Life*, appeared in 1777.

Whitehead, ROBERT (1823-1905), English engineer and inventor, born at Bolton-le-Moors, Lancashire. At Milan he set up for himself, inventing and patenting machinery. He went to Trieste (1848), but settled in 1856 in Fiume. Here his first torpedo was invented (1866), and the invention was adopted for use in the Austrian navy (1868). The British Admiralty followed suit (1871). Firing apparatus, air pumps, and other accessories of the torpedo are also manufactured at Fiume, while a branch of the factory was established near Weymouth in 1890. See TORPEDO.

Whitehead, WILLIAM (1715-85), English poet, born at Cambridge; was made tutor of Clare College in 1742. He was (1754) travelling tutor to the son of the Earl of Jersey, and in the Jersey family he found a permanent home. He was for some time reader of plays for Garrick, and wrote several dramas—*The Roman Father* (after Corneille), *Creusa* (after Euripides), *The School for Lovers* (after Fontenelle). At the close of 1757 he succeeded Colley Cibber as poet-laureate. He was attacked by Churchill, and retorted in his *Charge to the Poets*

(1762). He is not to be confused with Paul Whitehead, his contemporary. See *Life* by W. Mason, prefixed to Whitehead's *Poems* (3 vols. 1788).

White Horse, VALE OF THE. See BERKSHIRE.

White House. See WASHINGTON.

Whiteing, RICHARD (1840), English author and journalist, born in London; became a pupil of Benjamin Wyon, royal seal engraver, and distinguished himself by a series of articles in *The Evening Star*, republished as *Mr. Sprouts: his Opinions*. He has served on the editorial staff of *The Morning Star*, *The Manchester Guardian*, *Globe*, and *Daily News*; also with the Press Association. He has written the novels—*The Democracy* (1876), *The Island* (1888), No. 5 *John Street* (1899), *The Life of Paris* (1900), *The Yellow Van* (1903), *Ring in the New* (1906), *All Moonshine* (1907), and *Little People* (1908).

White Knights. See READING.

White Lady, in legend. The legendary White Lady of Scott's *Monastery* and of Scribe's *Dame Blanche* is derived from the Teutonic tradition, which speaks of a supernatural white woman attached to a royal or noble family. In France, whenever a king of the house of Bourbon was about to die, a tall woman, clad in white, was seen to walk along the galleries of the castle at midnight. The white woman appears also to peasants, to whom she gives some article which becomes transmuted into gold or silver. She has affinities with the Dame Berchta of Teutonic mythology. Like her, she is frequently described as engaged in spinning, or in beating flax. One tale speaks of three white ladies living in an enchanted castle, while no fewer than

'twelve white maidens' figure in another story. The white women of Dutch folklore are associated with caverns and hills.

White Lead is a basic carbonate of lead, $\text{Pb}(\text{OH})_2\text{PbCO}_3$, much used as a pigment. The best quality is prepared by the Dutch process, in which sheets or grids of pure lead are placed in pots containing a little dilute acetic acid. A number of these pots are stacked in a heap, surrounded by horse manure (or, better, spent tan), and allowed to stand for several months. As a result, lead acetate is formed, and then converted into the basic carbonate. This product is washed, ground, and dried at a moderate temperature. The process may be expedited by treating the lead in chambers with the vapours of acetic acid, carbon dioxide, and water; but the product is inferior. The same defect is also inherent in even more rapid processes that have been introduced. White lead is a soft, heavy, earthy powder, of crystalline structure. It has much greater 'covering' power than any other white pigment, but is poisonous both in preparation and in use (its use is prohibited in France), and is blackened by hydrogen sulphide. Other pigments, are largely substituted for it, mainly on the ground of its cost. Of these, one of the best is the sublimed white lead obtained by oxidizing galena in a blast of air, and catching the fume in woollen bags. White lead itself is also frequently adulterated by the addition of barium sulphate or chalk.

White Leg, a painful disease associated with swelling of one or both legs. It occurs chiefly during the puerperium, but both sexes and all ages are liable to the affection, which not infrequently follows typhoid and other continued diseases. It is generally due to venous obstruc-

tion and thrombosis, but in many cases the lymphatic vessels share in the obstruction. A painless form is described, in which the lymphatics alone are said to be affected. Usually the affection begins with pain and tenderness in the groin. Swelling appears with or soon after the onset of the pain. Treatment should be both local and constitutional. Hot fomentations with poppy heads or laudanum should be frequently applied. Opium may also be given internally.

Whiteley's, a huge commercial establishment, founded by William Whiteley (1831-1907), a Yorkshireman, in Westbourne Grove, London. The founder was fatally shot on his business premises. By his will he left £1,000,000 for houses for the aged poor. In 1911 large premises were opened in Queen's Road, Bayswater, London.

Whitelocke, BULSTRODE (1605-75), commissioner of the great seal under the commonwealth, was born in London. He sat in the Long Parliament as member for Great Marlow, and in 1648 became one of the commissioners of the great seal, a post which he again held under Cromwell's son. In 1651 Cromwell sent him as ambassador to Sweden. At the restoration he was pardoned. His *Memorials* (1682, better edition 1732) constitute an account of the civil war and commonwealth. He also wrote *Journal of the Embassy to Sweden* (ed. H. Reeve, 1855). See *Memoirs* by R. H. Whitelocke (1860).

White Mountains, group of mountains, New Hampshire, U.S.A., occupying an area of 1,300 sq. m. Under this name are commonly included most of the irregular groups of mountains scattered over the state; but the name is applied more particularly to the Presidential range in the S. part of Coos co., several sum-

mits of which exceed 5,000 ft., among them Mt. Washington (6,279 ft.).

White Plains, tn., New York state, U.S.A., co. seat of Westchester co., 20 m. N.N.E. of New York. It is a residential place, containing many fine mansions. There are several hospitals and homes and a large lunatic asylum. Pop. (1910) 15,949.

White River, Arkansas and Missouri, U.S.A., rises in the N.W. of the former state, crosses the boundary into southern Missouri, and then, turning S.E., flows through Arkansas to its junction with the Mississippi at the mouth of the Arkansas. It drains a large part of the Ozark plateau. Its length is about 800 m., and the area of its drainage basin 27,925 sq. m.

White Sea, a large gulf of the Arctic Ocean, penetrating Archangel government, N. Russia. Its length from N.W. to S.E. is 300 m., and its area 36,500 sq. m. It is frozen from October to May. The fisheries are of considerable importance. Archangel is the chief port.

White Star Line, a line of steamships owned by the Oceanic Steam Navigation Company, which was formed in 1869 by Messrs. Ismay, Inrie, and Co., of Liverpool. The *Oceanic* I. sailed on her maiden voyage to New York in 1871, and was rapidly followed by larger vessels—the *Britannic*, in 1874, the first to exceed 5,000 tons (excepting the *Great Eastern*); the *Teutonic* and *Majestic*, designed as mercantile cruisers; and the *Oceanic* (1899). The last-named was the first vessel to exceed 15,000 tons and 700 ft. in length. In 1899 a Liverpool, South African, and Australian service was established. The company also maintains lines between Liverpool and Boston, Boston and Mediterranean ports, New York and

Mediterranean ports, San Francisco, Yokohama, and Hong-kong, and also to New Zealand. In 1901 the *Celtic II.* (20,904 tons) was launched as the largest steamer ever built; but she has been surpassed by the *Cedric* (21,035 tons) and by the *Baltic* (23,876 tons), which first sailed in 1904, the *Adriatic II.* (25,000 tons), the two big Cunarders—*Mauretania* and *Lusitania* (32,000 tons)—and the *Olympic* and *Titanic* (45,000 tons). The total fleet, mostly leviathans, numbers 31 vessels, of an aggregate tonnage of 472,525.

White Swelling, a synonym for scrofulous disease of a joint.

Whitethroat, a name given to two members of the genus *Sylvia* (warbler). The common whitethroat (*S. cinerea*) is a frequent summer visitor throughout the British area, arriving about April. It is about five and a half inches long, and is grayish brown above, with a white throat, the colour deepening to buff on the breast. The song is sweet, but the male has also a harsh alarm note. Though largely insectivorous, the whitethroat eats fruits and berries in their season. Its ally, the lesser whitethroat (*S. curruca*), may be distinguished by the conspicuous dark-brown ear-coverts. It is very fond of fruit. See WARBLERS.

White Vitriol is zinc sulphate, $ZnSO_4 \cdot 7H_2O$. See ZINC.

Whiteway, SIR WILLIAM VALLANCE (1828-1908), colonial statesman, born in England. He was called to the Newfoundland bar in 1852, and in 1858 entered the legislature. After holding the office of speaker (1865-9) and that of solicitor-general (1873-78), he became premier and attorney-general (1878-85 and 1889-97). He was knighted in 1880 and made a privy councillor in 1897.

Whitford, par. and vil., Flintshire, Wales, 8 m. W.N.W. of Flint.

Coal is mined, limestone and freestone are quarried, and lead and zinc are also worked. Pop. (1911) reg. dist. 7,730.

Whitgift, JOHN (1530-1604), Archbishop of Canterbury, was born at Great Grimsby, Lincolnshire. In 1555 he was elected a fellow of Peterhouse, Cambridge; Lady Margaret professor of divinity (1563); master of Trinity College (1567); bishop of Worcester (1577); and Archbishop of Canterbury (1583). Whitgift enjoyed the favour of Queen Elizabeth, who upheld him in the severity of his *Star Chamber Decree*, which limited the freedom of the individual and of the press in religious matters. A collection of his writings has been made for the Parker Society by J. Ayre (1851-3). See Strype's *Life and Acts of Whitgift* (1718).

Whithorn (the *Leukopibia* of Ptolemy), parl. and royal bor., Wigtownshire, Scotland, 12 m. by rail s. of Wigtown, the burial-place of St. Ringan or Ninian. Pilgrimages were made to his shrine (*Candida Casa*) from all parts of Scotland. The cathedral is roofless; its chief feature is a beautiful round-headed archway. Pop. (1911) 1,170.

Whiting (*Gadus merlangus*) belongs to the same genus as the cod and the haddock, from which it may be distinguished by the absence of a barbel on the chin, the more slender form, and the presence of a dark spot at the root of the pectoral fin. It occasionally reaches a length of twenty-one inches. It is voracious and predaceous, living mostly on other fish. Females are twice more numerous than males. Spawning takes place principally in April and May. The female shedding about 300,000 eggs, which float in the water. The newly-hatched whiting is about one-seventh of an inch long; but growth is rapid, the

average size in November being nearly five inches. The female spawns when two years old. Shoals of young whittings visit the bays and in-shore waters in summer. It is found all round the shores of the United Kingdom, and extends into the North Sea and Mediterranean.

Whiting. See CHALK.

Whiting, tn., Indiana, U.S.A., in Lake co., on Lake Michigan, 15 m. s.s.e. of Chicago. Pop. (1910) 6,587.

Whitley and Monkseaton, urban dist., Northumberland, England, 2 m. N. of Tynemouth, is a sea-bathing and residential resort. Pop. (1911) 14,410.

Whitlow, or PARONYCHIA, is a term applied to various inflammatory conditions affecting the phalanges of the fingers, the thumbs, or more rarely of the toes, and generally leading to suppuration. As a rule, whitlows result from the introduction of septic material through a minute wound, such as a prick or a scratch. The deeper forms are intensely painful, and if unrelieved the inflammation and swelling may extend up the limb, and result in general blood-poisoning and speedy death. Hot fomentations and soothing lotions, such as lead and opium, may be applied at first; but should these fail to give speedy relief, early and free incision must be made, if possible, before suppuration occurs.

Whitman, tn., Massachusetts, U.S.A., in Plymouth co., 21 m. s.s.w. of Boston. It is a thriving industrial centre, with large shoe and paper factories. Pop. (1910) 7,292.

Whitman, WALT (1819-92), American poet, born at Long Island, New York. He never married; he never had any definite home. When he was about sixteen he tramped the countryside 'teaching school.' In 1839-

40 he obtained, at Huntingdon, the editorship of the *Long Islander*, and in 1846 that of the *Brooklyn Eagle*; but after less than three years he set out upon a prolonged wayfaring through the central, southern, and western states. But some two years later we find him back in Boston, and once more (1851) editing a journal, the *Freeman*. Four years later he became known to the American public as Walt Whitman the poet ('the mad poet' was a not uncommon designation), for in 1855 he published *Leaves of Grass*, that perturbing and revolutionary collection of unrhymed and irregular verse. When in Brooklyn Whitman had combined editing and miscellaneous literary work with the trade of building and selling small houses. From December of 1862 till July 1865 he saw much of the sad and pitiable side of the civil war, and has left us a record in *Drum-Taps*. In the ensuing years he was a clerk in government offices in Washington, and in 1879 he visited Denver and the west. From 1873 till his death his home was at Camden, New Jersey, just across the Delaware from Philadelphia. Notwithstanding the interest of *Drum-Taps*, *Democratic Vistas* (1871), and *Specimen Days* (1882), Walt Whitman is great by virtue of one book, or rather one life-work, *Leaves of Grass*. That he was a great artist in words is hardly to be maintained, but he is the only great American who has expressed the new creative energy and genius of his country in literature. *Leaves of Grass* is the first milestone on the national road of the literature of America. A final and complete edition of his works, both prose and verse, appeared in 1889. See W. D. O'Connor's *The Good Grey Poet* (1866); monographs by Bucke (1865) and W. Clarke (1892); *Life*

by H. B. Binns (1905) and by Bliss Perry (1906); and *Days with Walt Whitman*, by E. Carpenter (1906).

Whitney, MOUNT, highest peak (over 14,500 ft.) in U.S.A. (excluding Alaska), in the Sierra Nevada, E. California, on the parallel of 36° 36' N. lat.; named after Professor J. D. Whitney.

Whitney, ELI (1765-1825), American inventor, born at Westborough, Massachusetts; devoted himself to teaching in Georgia, where he invented the first cotton gin for separating the seed from the cotton. For this the state of South Carolina voted him £10,000. He next (1798) turned to manufacturing firearms for the government, and was the inventor of other improvements on mechanical methods, from which he reaped a large fortune.

Whitney, JOSIAH DWIGHT (1819-96), American geologist, born at Northampton, Massachusetts, brother of the philologist. He was engaged in the geological survey successively of the regions of Lake Superior, Iowa, Upper Missouri, Wisconsin, and California. From 1855 he filled the geological chair in Harvard university. Among his more noted publications are the *Metallic Wealth of the United States* (1854), and the six volumes (1864-70) gathering up the fruits of his *Geological Survey of California*.

Whitney, WILLIAM DWIGHT (1827-94), American philologist, born at Northampton, Massachusetts. In the summer of 1849 he acted as assistant of the United States geological survey. His special bent of study was, however, shown by his taking up Sanskrit. From 1854 professor of Sanskrit, and from 1869 also of comparative philology, at Yale, he prepared, in co-operation with Roth, an edition of the *Atharva Veda* (1856). He further

organized, and for many years took charge of, the department of modern languages in Sheffield scientific school. His lectures on *Language* were published in 1867. President of the American Oriental Society (1884-90), he was the leading contributor to its *Journal*, as also to the *Transactions* of the Philological Association, which he helped to found in 1869. His *Sanskrit Grammar* (1879) at once took the first place. Another monumental work was *The Century Dictionary* (1888-91), of which he was editor-in-chief.

Whitstable, seapt. and bathing resort, Kent, England, on Whitstable Bay, 6 m. N.W. of Canterbury, is noted for its oyster fishery. Tankerton is a pleasant suburb. Pop. (1911) 7,984.

Whitsunday. See **TERMS** and **PENTECOST**.

Whittier, JOHN GREENLEAF (1807-92), American poet, was born near Haverhill, Massachusetts. In 1829 he was editor of the *American Manufacturer*, and subsequently he edited several other papers. His sympathies were strongly against the slave trade, and his abolitionist poems won him the friendship of William Lloyd Garrison; indeed he has been called the poet laureate of abolition. Although somewhat lacking in fire and concentrated passion, his poems have much freshness and beauty. His *Works* appeared in 7 vols. (1888). See *Life* by S. T. Pickard (1894).

Whittington, DICK (1358-1423), was the son of a Gloucestershire knight. In 1380 he was a substantial city mercer, and records exist of his having lent large sums of money to Richard II., Henry IV., and Henry V. He was lord mayor in 1397, and again in 1406. His benefactions aided St. Bartholomew's Hospital, Greyfriars library, and the Guildhall. He rebuilt New-

gate, and founded a small hospital and college (suppressed in 1548) near his parish church of St. Michael de Paternoster. See *The Model Merchant of the Middle Ages*, by Samuel Lysons (1860); also the *Life*, by Besant and Rice (1894).

Whittington and Newbold (formerly NEWBOLD AND DUNSTON), urban dist., Derbyshire, England, 2 m. N. of Chesterfield; has coal mines and iron works, and manufactures earthenware. Pop. (1911) 17,218.

Whittlesey, or WHITTLESEA, mkt. tn., Cambridgeshire, England, 6 m. E. by s. of Peterborough. St. Mary's church is partly Norman. Brick-making is important. A little to the north is the artificial cut forming the new R. Nen. Pop. (1911) 4,207.

Whitwick, par. and tn., Leicestershire, England, 7 m. w.s.w. of Loughborough. Hosiery is manufactured and coal is mined in the district. Pop. 3,700.

Whitwood, urban dist., W. Riding, Yorkshire, England, 4 m. N.W. of Pontefract; has coal mines. Pop. (1911) 5,518.

Whitworth, urban dist., Lancashire, England, 3 m. N.W. of Rochdale; has cotton mills. Coal is mined and slate is quarried. Pop. (1911) 8,872.

Whitworth, SIR JOSEPH (1803-87), English engineer, was born at Stockport. Whilst working in London he made his first important discovery—a truly plane surface; and in 1833 he set up in business for himself as a tool-maker in Manchester. During the next twenty years he gradually developed his system of standard measures and gauges. After the Crimean war he began to make experiments with rifles, and later with cannon. The greatest of his discoveries in this connection was his method of obtaining sound castings from compressed steel. In 1868 he

endowed thirty scholarships with the Science and Art Department for skill and knowledge of mechanics and cognate subjects. In 1869 he was created a baronet. The business he founded is now amalgamated with Armstrong's, under the name of Sir W. G. Armstrong, Whitworth, & Co., Ltd.

Whooper. See SWAN.

Whooping-cough. See HOOPING-COUGH.

Whortleberry, BILBERRY, or BLUEBERRY (Scottish BLAEBERRY), a common little British hill shrub, *Vaccinium myrtillus*, belonging to the order Vacciniaceæ. It bears solitary, globose, reddish and green flowers, followed by dark-blue berries, which possess a pleasant and characteristic flavour. In America the name huckleberry is given to this and kindred shrubs. See VACCINIUM.

Whydah, or WHIDAH, seapt. on Bight of Benin, Dahomey, W. Africa; was a former slave-trading centre. Pop. 20,000.

Whydah Birds. See WEAVER-BIRDS.

Whymper, EDWARD (1840-1911), English mountaineer and explorer, was born in London. He ascended Mt. Pelvoux (1861); the Pointe des Ecrins, one of the highest peaks in the Dauphiné Alps (1864); the Matterhorn (1865); visited Greenland (1867 and 1872), Ecuador and the Andes (1879-80), and Canada (1901). His best-known works are *Scrambles Among the Alps* (1871), *How to use the Aneroid Barometer* (1891), *Travels amongst the Great Andes of the Equator* (1892), *Chamonix and Mont Blanc* (new ed. 1911), *Zermatt and the Matterhorn* (new ed. 1911).

Whyte, ALEXANDER (1837), Scottish preacher; professor of New Testament Literature and principal of New College, Edinburgh, since 1909; born at Kirriemuir, Forfarshire. In 1870 he was called to be colleague and suc-

cessor to Dr. Candlish at Free St. George's, Edinburgh, and three years later he was left sole pastor. His chief works are *Characteristics of William Law* (1893), *Jacob Behmen, an Appreciation* (1895), *Bunyan Characters* (1893-95), *Samuel Rutherford and some of his Correspondents* (1894), *Lancelot Andrewes and his Private Devotions* (1896), *Bible Characters* (1896-1900), *Santa Teresa* (1897), *Father John* (1898), *Sir Thomas Browne, an Appreciation* (1898), *Newman* (1901), *The Apostle Paul* (1903), and *Bishop Butler* (1903).

Whyte-Melville, GEORGE JOHN (1821-78), Scottish novelist, born near St. Andrews; served in the army in 1839, and again in the Crimean war. His literary career began in 1850. His novels are full of freshness and charm, and deal chiefly with field sports and country pursuits. He was killed by a fall from his horse. Among his works are *Digby Grand* (1853), *General Bounce* (1855), *Kate Coventry* (1878), *Holmby House* (1860), *Market Harborough* (1861), and *Songs and Verses* (1869).

Wlarton, tn., Bruce co., Ontario, Canada, 20 m. N.W. of Owen Sound, on Colpoys Bay, an arm of Georgian Bay. Lumber, furniture, and cement are manufactured. Pop. 2,600.

Wiborg. See VIBORG.

Wichita, city, Kansas, U.S.A., co. seat of Sedgwick co., 220 m. S.W. of Kansas City, on the Arkansas R.; with flour mills and meat-packing establishments. It is an important shipping point for live stock and grain, and has large wheat elevators. Here is Friends' University (400 students in 1910). Pop. (1910) 52,450.

Wichita Falls, tn., Texas, U.S.A., co. seat of Wichita co., 110 m. W. by N. of Sherman. It has a large shipping trade in grain, and natural oil is found in the district. Pop. (1910) 8,300.

Wick, roy. bur., seapt., and co. tn. of Caithness, Scotland, on Wick Bay, opposite Pulteneytown, 161 m. by rail N.N.E. of Inverness. It is a herring-fishing centre, and manufactures fish guano, boats, and nets. Pop. (1911) 9,086.

Wickham, tn., suburb of Newcastle, New South Wales, on Hunter R. It has engineering works, sawmills, and brewery. Pop. 8,000.

Wickliffe. See WYCLIFFE.

Wicklow. (1.) Maritime co., prov. Leinster, Ireland. In the centre, trending N. and S., are the Wicklow Mts. (Lugnaquilla, 3,039 ft.; Kippure, 2,473 ft.; Duff Hill, 2,369 ft.), intersected by picturesque gorges and valleys. The coast presents steep cliffs. Rivers are Slaney and Avoca, the last formed by the union of Avonmore and Avonbeg (the 'Meeting of the Waters,' immortalized by Moore). The Liffey rises in the north. In the Vartry valley are the reservoirs of the Dublin waterworks corporation. Amongst glens noted for their fine scenery are Glenmalur; Glendalough, with its beautiful lake; Vale of Avoca (also Ovoca), Devil's Glen, The Dargle, Powerscourt. The soil is fertile in the lower parts, but agriculture is limited. Gold, lead, copper, sulphur, and granite occur. The county returns two members to Parliament. Area, 781 sq. m. Pop. (1911) 60,603. (2.) Market tn., Co. Wicklow, Ireland, 31 m. S.E. of Dublin. A new harbour has been constructed, at a cost of £85,000. There are also large chemical works. Ores and grain are exported. Near the town is the 'Murrough,' which has been acquired by government for a military station and artillery practice. Pop. 3,000.

Wickrath, tn., Prussia, in Rhine Prov., 15 m. S.S.W. of Crefeld. Pop. (1910) 6,770.

Widgeon, or **WIGEON** (*Mareca penelope*), a duck which breeds in Scotland, especially the north, while it winters in large numbers in parts of England. The male is finely pencilled with black above and white below, with a brown and buff head and dark gray quills. It has a whistling cry, whence the name of 'whew' or 'whewer duck,' and feeds largely on the sea-grass *Zostera*. There are two other species of the same genus, both American.

Widin, or **VIDIN**, cap. of Widin dist., Bulgaria, in extreme N.W. of country, on r. bk. of Danube; the seat of a metropolitan; has an ancient citadel (dismantled since 1878), a school of viticulture, tobacco factories, breweries, and filigree works. Pop. (1910) tn. 16,433; dist. 237,148.

Widnes, munic. bor., Lancashire, England, 13 m. S.E. of Liverpool; is a centre of alkali and soap manufacture. There are also iron foundries and paint works. Pop. (1911) 31,544.

Widow. See **DISTRIBUTION**, **STATUTES OF**; **HUSBAND AND WIFE**; and **JUS RELICTÆ**.

Widow-bird. See **WEAVER-BIRDS**.

Widsith, a poem of 143 lines in the *Exeter Book*. It has been analyzed into four parts—an introduction, a list of legendary kings, the Eormanric catalogue, and the Ealdhild lay, the last three being curiously interwoven with one another. The fact is, that the poem contains very early elements, among which imitative passages have been inserted. If we could believe Widsith's own statement, he lived about 400 A.D., for he was the contemporary of Eormanric and of Attila. The text is in Grein-Wülker's *Bibliothek der angelsächsischen Poesie* (1857-64), and portions of it in K. M. Warren's *Treasury of English Literature*, vol i. (1908).

XXIII.

Wiebelskirchen, vil., Prussia, in Rhine Prov., 36 m. S.E. of Treves. Pop. (1910) 8,722.

Wieland, **CHRISTOPH MARTIN** (1733-1813), German writer, was born near Biberach in Württemberg. His early work is serious, somewhat dogmatic, and of little intrinsic value—*Der geprüfte Abraham* (1753), *Empfindungen eines Christen* (1755). About 1760 the influence of French and English philosophers, and the friendship of Count Stadion, an enthusiastic admirer of French literature, led to his preaching the same easy-going hedonism as his French models. The best-known work of this period is his novel *Agathon* (1766-7), which tells to some extent the story of Wieland's own development. Some short stories, charmingly told in graceful verse, were written about the same time. His appointment to a professorship at Erfurt in 1769 appears to have coincided with a change to a profound conception of the problems of life. His philosophical novel, *Der Goldene Spiegel* (1772), decided the Duchess Amalie of Saxe-Weimar to offer him the tutorship of her sons. At Weimar, Wieland wrote some good short stories, especially *Geron der Adelich* (1777); the admirable ironical tale *Die Abderiten* (1781); and his greatest work, the epic *Oberon* (1781), the main incidents of which are taken from the old French tale of Huon de Bordeaux. The elegance of style and the humour here displayed were entirely novel in German literature. Wieland translated twelve plays of Shakespeare (1762-6), and writings of Cicero and Horace; and showed consummate tact as editor (1773-89) of *Der Teutsche Merkur*, the literary organ of the Weimar poets. A complete edition of Wieland's works, in 53 vols., was published in 1818-28; another in

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1900 (ed. Klee); his *Ausgewählte Briefe*, in 6 vols., in 1889. Selections from his works have been made by Proehle (6 vols. 1887), in Kürschner's *Deutsche National-Litteratur*, and by Muncker (6 vols. 1889). There are *Biographies* by Döring (1853) and Seuffert (1900).

Wieliczka, tn., Galicia, Austria, 9 m. by rail s.e. of Cracow; is noted for its rock-salt mines, containing subterranean town with chapels, etc. The annual product is estimated at 60,000 tons. Serious damage was done by floods in 1868 and 1879. Pop. (1911) 7,117.

Wien, Austria. See VIENNA.

Wiener-Neustadt, tn., Lower Austria, 26 m. s. by w. of Vienna. It has a 12th-century castle, used since 1752 as a military academy. Locomotives, machinery, earthenware, and leather are manufactured. Pop. (1911) 32,869.

Wienerwald, a mountainous, largely forested district of Lower Austria, w. of Vienna. Among the better-known summits are the Hoher Lindkogel, near Baden (2,780 ft.), the Hohenstein (2,120 ft.), and the Kahlenberg (1,404 ft.) and the Leopoldsberg (1,380 ft.), both near Vienna.

Wieniawski, HENRI (1835-80). Polish violinist and musical composer, born at Lublin; began to tour when eleven, and within a few years had an almost unrivalled reputation throughout Europe and America. He possessed extraordinary executive powers, was equally great as an exponent of classical and virtuosic music, and his compositions are very frequently performed in public. He was a professor at St. Petersburg Conservatory (1862-7) and at Brussels (1874-7).

Wier, JOHANN (1516-88), Dutch opponent of witchcraft, was born at Grave in N. Brabant. He began to practise medicine at Arnheim in 1545, and in 1550 became physician to the Duke of

Juliers and Cleves. In 1563 he published *De Præstigiis Dæmonum et Incantationibus ac Veneficiis*. The work was placed on the Index. He also wrote *De Lamiis et Pseudomonarchia Dæmonum*, a satyric description of the underworld and its hierarchy. His *Opera Omnia* appeared in 1660. See *Dr. J. Weyer* [Wier], by Binz (1885).

Wierden, comm., Netherlands, in Overijssel, 36 m. n.e. of Arnhem. Pop. (1910) 7,257.

Wiertz, ANTOINE JOSEPH (1806-65), Belgian painter of historical subjects and portraits, born at Dinant. In 1832 he gained the grand prize at the Antwerp Academy, and settled (1836) at Liège, and in 1848 at Brussels, where out of state funds a studio, now known as the Musée Wiertz, was built for him. All his works indicate a grotesque and fantastic imagination. Wiertz was also a writer on art, and was the inventor of a new method of painting styled *peinture mate*. His writings appeared as *Œuvres Littéraires* (1869). See *Lives* by Labarre (1866) and Claessens (1883).

Wiesbaden (Lat. *Mattiacum*), wat.-pl., prov. Hesse-Nassau, Prussia, on s. slopes of Mt. Taunus, 6 m. n.w. of Mainz; has thirty hot springs. The gaming tables were abolished in 1872. Pop. (1910) 109,036. See Böttcher's *Wiesbaden and her Thermal Springs* (Eng. trans. 1910).

Wiesen, Swiss health resort, canton Grisons, in the Davos valley, 12 m. s.w. of Davos, at an altitude of 4,771 ft.

Wiesloch, tn., Germany, in Baden, 16 m. s.s.e. of Mannheim. Pop. (1910) 6,538.

Wife. See HUSBAND AND WIFE, and MARRIAGE.

Wig (contraction of 'periwig,' 'peruque'), an artificial head-dress of hair, used in case of baldness on the stage, by judges

and barristers, and formerly, for fashion, by all classes. Found on Egyptian mummies, known to the Eastern nations, and to the Greeks and Romans, it was worn by Hannibal as a disguise (Livy), by the emperors Otho, Domitian, Caracalla, to cover their baldness. But the Roman wig was a kind of skull-cap fringed with hair. More artistic, no doubt, were the blond wigs for ladies, alluded to by Ovid and Martial. The early church writers (e.g. Tertullian) denounced wigs as 'of the devil,' but finally adopted them as professional attire in the 17th century. In England Bishop Blomfield was the first to wear his own hair, and Archbishop Sumner wore a wig (1858) at the marriage of the princess royal. Wig-wearing was rendered fashionable in France by Louis XIII., though in the 14th century false tresses (*coifs à templettes*) had been worn by ladies. Louis XIV. (1673) raised the wig to its highest degree of size and fashion. Louis XV. reduced its dimensions, and Benjamin Franklin stood wigless before Louis XVI. The revolution abolished wigs, but the patriots introduced the 'Brutus' type. (See Thiers's *Histoire des Perroquets* (1690), and *L'Encyclopédie Perruquière*, 1757.) 'Great Eliza' had many wigs, and Mary of Scotland died in an auburn head-dress. On the stage blond wigs were worn by heroes, black by villains (Lloyd in *The Actor*, 1762). Queen Anne's reign saw the apotheosis of the English wig, and produced the Ramillies variety. Hogarth has illustrated *The Five Orders of Periwigs* (episcopal, aldermanic, legal, 'queerinthian'—for noblemen—and composite).

Wigan, munic., parl., and co. bor., Lancashire, England, 19 m. N.W. of Manchester. There are cotton factories, oil works, foundries, and railway-wagon works, and trade in coal, from

collieries in the district. Pop. (1911) 89,171.

Wigeon. See WIDGEON.

Wiggin, KATE DOUGLAS, afterwards MRS. RIGGS (1857), American authoress, born in Philadelphia; organized the first free kindergarten schools for poor children on the Pacific coast. Among her numerous publications are *The Birds' Christmas Carol* (1888); *The Story of Patsy* (1889); *A Cathedral Courtship* (1893); *The Village Watch Tower* (1895); *Marm Lisa* (6th ed. 1905); *Penelope's Progress* (1898); *Penelope's Experiences in Ireland* (1901); *Penelope's Experiences in Scotland* (18th ed. 1908); *Penelope's English Experiences* (1900); *The Diary of a Goose Girl* (1902); *Half-a-dozen Housekeepers* (new ed. 1904); *Rebecca of Sunnybrook Farm* (1904); *Rose of the River* (1905); and *Kindergarten Principles and Practice* (1896), and other works in collaboration with her sister, Nora Smith.

Wight, THE ISLE OF, isl., Hants, England, separated from the mainland by the Solent and Spithead, and bounded on s. by the English Channel. Shape, an irregular diamond, 23 m. E. and W., 13 m. N. and S. The coasts are sloping on N., more uniform on s., and bordered by cliffs, intersected by picturesque 'chines' excavated by small streams, and generally covered with verdure. The Undercliff (10 m.) is a beautiful stretch on the s. coast. Off the w. extremity are the Needles, isolated jagged rocks, with lighthouse. The island is very hilly. Highest summit, St. Boniface Down (about 787 ft.), near Ventnor. Cowes and Ryde, in the N., are yachting centres; Newport (the capital), Ventnor on the Undercliff (specially recommended in pulmonary affections), Shanklin, Bonchurch, Freshwater, Yarmouth, and other places, are

favourite resorts. The island, named by the Romans Vectis, was held by them for over four hundred years. In the 6th century it was taken by the Saxons. Since the time of Edward I. it has been under wardens appointed by the crown, the present governor being H.R.H. Princess Henry of Battenberg. Area, 147 sq. m. Pop. (1911) 88,193. See Cooper and Moncrieff's *Isle of Wight* (1908), G. E. Mitton's *The Isle of Wight* (1911), and J. L. Whitehead's *The Undercliff of the Isle of Wight* (1911).

Wigston Magna, urban dist., Leicestershire, England. Here are large railway workshops of the Midland Ry. Co. Pop. (1911) 8,652.

Wigton, mrkt. tn., Cumberland, England, 11 m. s.w. of Carlisle; has tanning, jam, and other industries. Pop. (1911) 3,687.

Wigtown. (1.) County in extreme s.w. of Scotland, the w. div. of ancient Galloway. Two arms of the Irish Sea—Luce Bay and Wigtown Bay—enter on the s., and Loch Ryan, an arm of the Firth of Clyde, enters on the n.w. The coast in general is bold and rocky; the interior consists of moorland and rolling hill. Streams and lochs are numerous but small. The county is generally divided into three parts—(1) the Rhinns of Galloway, the peninsular part; (2) the Machers, the triangular portion between Luce Bay and Wigtown Bay; and (3) the moors to the N. Some 49 per cent. of the area is under cultivation, the chief crop being oats, but the chief industries are cattle-raising and dairy-farming, and creameries are becoming numerous. Pop. (1911) 31,990. (2.) Town, roy. and munic. bur. and seapt., Wigtownshire, Scotland, on a hill overlooking the w. shore of Wigtown Bay, 79 m. s. by w. of Glasgow; has a monument on Windy Hill to the Wigtown mar-

tyrs, Margaret Wilson and Margaret MacLachlan, who on May 11, 1685, for refusing the Abjuration Oath, were tied to stakes in the Water of Bladnoch, and were drowned by the incoming tide. Pop. (1911) 1,368.

Wigwam, the name given to the hut or dwelling-place of the Indians of N. America. It is of a conical shape, and is built of some light material, such as the bark of trees. Sometimes the skins of animals stretched across poles constitute a wigwam.

Wijk-aan-Zee ('on Sea'), seaside resort, Netherlands, prov. N. Holland, on North Sea, 10 m. N.W. of Haarlem. Pop. (1910) 2,915.

Wi-ju, tn., Korea, on s. bank and near mouth of Yalu R., 212 m. N.W. of Söul. It was opened to foreign trade in January 1911. Chief commercial port with China. Pop. 20,000.

Wil, tn., Switzerland, canton of and 15 m. w. by N. of St. Gall. Pop. (1910) 6,862.

Wilberforce, SAMUEL (1805-73), English prelate, son of William Wilberforce, was born at Clapham, London. He was rector of Brighthelm, Isle of Wight (1830-40), and of Alverstoke (1840-5), being also during this period successively archdeacon of Surrey, canon of Winchester, and dean of Westminster. In 1845 he became bishop of Oxford, and in 1869 bishop of Winchester. He was killed by a fall from his horse. In the House of Lords he was the spokesman of the Church, and it was owing to his efforts that authority was restored to the Convocations. His verbal duels with Lord Westbury are a matter of history. Although at one time popularly suspected of a leaning to Roman Catholicism, he was in reality strongly opposed to any attempt to Romanize the Church of England. A similar misunderstanding existed over his attitude to-

wards Hampden, whose appointment to the see of Hereford Wilberforce at first opposed and afterwards favoured. His chief works were *Letters and Journals of Henry Martyn* (1837); *Eucharista, Agathos* (1839); *History of the Protestant Episcopal Church in America and Rocky Island* (1840); *Heroes of Hebrew History* (1870). See *Life of S. Wilberforce*, by his son and Ashwell (1879-82); *Bishop Wilberforce*, by Daniell (1891); and *Life*, by R. C. Wilberforce (1905).

Wilberforce, WILLIAM (1759-1833), English philanthropist, was born at Hull. He entered Parliament as member for Hull when only twenty-one, supporting Pitt, of whom he became a fast personal friend. In 1787 Wilberforce became parliamentary leader of a committee of philanthropists pledged to the cause of abolition, and from this time he exerted all his powers in its support. Owing to his efforts, aided by the influence of Pitt resolutions condemning the slave trade were on three occasions (in 1789, 1791, and 1804) passed by the House of Commons, but it was not until 1807, after the death of Pitt, that the Bill of Abolition became law. Wilberforce's energies were then transferred to the cause of emancipation. He retired from Parliament in 1825. He wrote a book on *Practical View of Christianity* (1797). See *Memoirs of W. Wilberforce*, by his sons (1838), in 5 vols., and a condensed ed. (1868) in 1 vol. Also *Correspondence*, by his sons (1840).

Wild, JONATHAN (c. 1682-1725), receiver of stolen goods and informer, born at Wolverhampton; became the head of an elaborate organization of thieves in London. His career was, however, checked by imprisonment, on the ground of causing a riot, and terminated by hanging at Tyburn. See Jackson's *Newgate Calendar*;

also *History of the Life of Jonathan Wild*, by H. D. (1840); and Fielding's satirical *History of the Life of the late Mr. Jonathan Wild the Great* (1743).

Wildbad, wat.-pl., in the Black Forest, Württemberg, Germany. 20 m. s.s.e. of Carlsruhe; has hot springs and baths. Pop. (1910) 4,067.

Wild Birds Protection Acts, 1880, 1881, 1894, 1896, 1902, 1904, 1908. Any person killing, taking, or attempting to kill or take, or exposing for sale, between the 1st of March and the 1st of August, any of 86 different kinds of birds is liable to a fine of £1, and in the case of any other wild bird (except when the person killing or taking is the occupier of the land or some one authorized by him) to a reprimand on the first offence and a fine of 5s. per bird for a subsequent offence. The acts do not apply to the island of St. Kilda. By the Act of 1894 the secretary of state, on the application of the county council, may forbid the taking of wild birds' eggs at any season or in any district.

Wild Boar. See BOAR.

Wilde, JANE FRANCISCA, LADY (1826-96), Irish authoress, was born at Wexford, and became early imbued with Nationalist ideas, and contributed largely to the columns of the *Nation*, under the pseudonym of 'Speranza.' An article of hers in the last issue (1848), entitled '*Jacta alea est*,' was the principal charge against Charles Gavan Duffy when tried for treason. She published *Poems by Speranza* (1871); *Ancient Legends, etc., of Ireland* (1887); *Ancient Cures, Charms, and Usages of Ireland* (1890); *Notes on Men, Women, and Books* (1891); *Social Studies* (1893).

Wilde, OSCAR O'FLAHERTIE WILLS (1856-1900), Irish author and dramatist, born at Dublin, second son of Lady Wilde. In

1878 he won the Newdigate prize at Oxford with the poem *Ravenna*. He aspired to be the chief hierophant of the great movement captained by Ruskin, by Rossetti, by William Morris, by Edward Burne-Jones, and others — to demonstrate in life the theoretical ideals of beauty set forth by Walter Pater. It has been said that he owed much to his extreme Celtic temperament, and certainly in wit and verbal fencing no dramatist since another and greater Irishman, Sheridan, can be compared with him. In 1882 he went to America, and gave no fewer than two hundred addresses on æsthetic philosophy; and, while in the United States, produced a drama called *Vera*. By 1890 he had achieved a high reputation as author and dramatist, besides maintaining his position as 'the Beau Brummel of society and the arts.' *The Happy Prince and Other Tales* (1888) was followed by *Lord Arthur Savile's Crime and Other Stories*, his chief prose work, *The Picture of Dorian Gray*, and a brilliant and suggestive volume of essays, *Intentions* (1891); in this last year also was produced in New York his play *The Duchess of Padua*. In 1892 his first dramatic success was won by *Lady Windermere's Fan* (published in 1894), followed by *A Woman of No Importance* in 1893, *The Ideal Husband* (produced in 1895), and *The Importance of being Earnest* (produced 1895, but not published till 1899). His play *Salomé* (1893), written in French, was refused by the licenser of plays on account of its Biblical subject, but was produced in Paris (1894) by Sarah Bernhardt. His other books are the *Ballad of Reading Gaol* (1898) and *De Profundis* (1905). In March 1895 Wilde instituted an action against the Marquis of Queensberry, with the result that

the evidence against the plaintiff himself of indulging in immoral practices was so overwhelming that his arrest and trial became inevitable. After trial he was sentenced to two years' imprisonment with hard labour. It was during this period that *Reading Gaol* and *De Profundis* were written. See *Life*, by R. H. Sherard (1902). A complete edition of Wilde's works was published by Methuen in 1908-9.

Wildebeest. See GNU.

Wildenbruch, ERNST VON (1847-1909), German novelist, poet, and dramatist, born at Beirut in Syria. After going through the wars of 1866 and 1870-1 he entered the state service, and was appointed a judge at Frankfort and at Berlin, and in 1877 entered the Foreign Office. Wildenbruch won his greatest fame by his dramas, such as *Harold*, *Die Karolinger*, *Der Mennonit*, *Die Quitzows*, *Generalfeldoberst*, *Heinrich und Heinrichs Geschlecht*, *Die Tochter des Erasmus*, *König Laurin*. He also won recognition as a novelist with *Der Meister von Niagara* and *Novellen*, and as a poet with *Vionville*, *Sedan*, and *Lieder und Balladen*.

Wildenschwert, tn., Austria, in Bohemia, 90 m. E. of Prague. Pop. (1911) 6,559.

Wilderness, desolate and swampy district in N.E. Virginia, U.S.A., 2 m. S. of the Rapidan R.; was on May 5 and 6, 1864, the scene of an indecisive battle between the Federals under Grant and the Confederates under Lee.

Wildervank, comm., Netherlands, prov. of and 16 m. S.E. of Groningen. Pop. (1910) 9,424.

Wild Fowl, a term applied generally to wild birds shot for sport, especially to ducks, geese, and other water-fowl, and to shore game-birds. From its vagueness the term is falling into disuse. See *Wild Fowl*, in

'Fur, Feather, and Fin' Series (1905); also DECOY, DUCK SHOOTING, CLOSE TIMES, and WILD BIRDS PROTECTION ACTS.

Wild Hunt, a phantom chase of German legendary lore. The common predominating idea is that of the appearance of a pack of hounds and mounted men careering in full cry across the midnight sky, to the accompaniment of a peculiar rushing sound. The presence of the Wild Huntsman, with his train of followers, bodes evil to the spectator, and dire calamity is certain to fall upon any one who may have the temerity to address him. In England the same idea of a ghostly aerial hunt finds expression in the legendary tales associated with Gabriel's Hounds, the Wisht Hounds, and so forth.

Wilfrid, ST. (634-709), bishop of York, was born in Northumbria, and brought up in the monastery at Lindisfarne. He became (658) leader of the pro-Roman party, and won over the king of Northumbria to their side. He was chosen bishop of York, but suffered shipwreck on his way to Rome, and preached to the heathen Frisians. See *Life in Raine's Memorials of the Church of York* (1879).

Wilhelmina (1880), queen of Holland, or, as her full name runs, Wilhelmina Helena Pauline Maria, born at the Hague, her father being William III., and her mother Emma, a princess of Waldeck-Pyrmont. Wilhelmina succeeded to the throne in November 1890, being placed under the care of her mother as queen-regent. On attaining her eighteenth year she assumed the reins of power. In February 1901 she married Henry Duke of Mecklenburg-Schwerin, who took the title of Prince Consort.

Wilhelmsburg, comm., Prussia, in Hanover, 3 m. N.N.E. of Harburg. Pop. (1910) 28,242.

Wilhelmshaven, sea-bathing resort and great North Sea naval base of Germany, on the W. side of Jahde Bay, 41 m. N.W. of Bremen; was inaugurated by King William in 1869. Besides the old and new harbours, there are an equipment dock, a shipbuilding basin with dry docks, torpedo boat coaling basins, and naval barracks with accommodation for 2,400 men. New dock and harbour works have also been undertaken. The First Squadron of the German High Sea Fleet is stationed here. Pop. (1910) 35,047.

Wilhelmshöhe. See KASSEL. **Wilkau**, vil., Saxony, to the S.E. of Zwickau; has iron foundries and spinning mills. Pop. (1910) 8,122.

Wilken, GEORGE ALEXANDER (1847-91), Dutch ethnographer, born in Java; served in the Dutch Indian Civil Service. In 1885 he was appointed, at Leyden in Holland, professor of the geography and ethnography of the Indian Archipelago, on which he afterwards wrote a number of learned treatises.

Wilkes, CHARLES (1798-1877), American naval officer, born in New York. In a United States expedition (1838-42) he discovered the Antarctic continent, and published a *Narrative* (5 vols. 1845). In November 1861 he captured J. M. Mason and J. Slidell, Confederate commissioners, from the British steam-packet *Trent*, and afterwards commanded a squadron in the W. Indies, and was made a rear-admiral (1866). (See also TRENT AFFAIR.) He also wrote *Western America* (1849), and *Theory of the Winds* (1856).

Wilkes, JOHN (1727-97), English politician, was born in London. He entered Parliament in 1757 as member for Aylesbury and a supporter of Pitt; but disagreeing with the foreign policy of the government, he

attacked it by speech and pamphlet. In June 1762 he founded the *North Briton*, a paper which existed for the sole purpose of satirizing the government, Lord Bute, and the court, and which, owing to an article on the king's speech in No. 45, was suppressed as a seditious libel. Wilkes himself was arrested, and although discharged by the judges on the ground of privilege, as a member of Parliament, was in the autumn of the same year (1763) expelled from the House of Commons, and outlawed, not only for reprinting No. 45, but for printing (though privately) an 'impious libel' entitled an *Essay on Woman*. He lived in Paris and Italy until 1768, when he returned to London in defiance of his outlawry, and was at once elected M.P. for Middlesex. He was again expelled from the Commons, and imprisoned for two years; but being, in 1774, re-elected, he continued to represent Middlesex until his retirement in 1790. Wilkes, on his release from prison in 1770, championed the city in its contests with Parliament and court. He was elected lord mayor, and upheld the power of the law during the Gordon riots.

Wilkes was celebrated for his ugliness and his wit. He was at once a man of fashion, a lover of letters, a keen politician, and one of the most vigorous personalities of his age. He wrote several numbers of the *Monitor* (between Nos. 340 and 380), and the first forty-six numbers of the *North Briton*. Collections of his *Letters* were published in 1804 and 1805, and of his *Speeches* in 1777 and 1786. See *Life* by Fitzgerald (1889).

Wilkes-Barre, city, Pennsylvania, U.S.A., co. seat of Luzerne co., in a large anthracite coal region, 100 m. N.N.W. of Philadelphia. Its principal manufac-

tures are silk and cotton goods. Pop. (1910) 67,105.

Wilkie, SIR DAVID (1785-1841), Scottish painter and etcher, the foremost of British historical genre painters, was the son of the minister of Culter, Fifeshire. He entered the Royal Academy Schools at Edinburgh when fourteen. *Pittlessie Fair*, the first of a series of pictures depicting national and parochial life, was painted in 1804, and was followed by his *Village Politicians*, *The Blind Fiddler*, *Rent Day*, *The Chelsea Pensioners*, and others. He was elected A.R.A. in 1809, and R.A. in 1811; limner for Scotland in 1823; painter in ordinary to George IV. in 1830; and knighted in 1836. During the latter part of his career he painted many portraits, among others of Sir Walter Scott and Family at Abbotsford (1817); also the portrait group *Queen Victoria's First Council*. In 1840 he went to Constantinople, the Holy Land, and Egypt; and dying on the homeward journey, he was buried at sea off Gibraltar. The national collections of London and Edinburgh, the municipal galleries of Glasgow and Liverpool, are rich in Wilkie's pictures. See *Lives* by A. Cunningham (1843), Lord R. Gower (1902), and Bayne (1903).

Wilkins, JOHN (1614-72), bishop of Chester, born in Northamptonshire. He became successively vicar of Fawsley (1637), chaplain to the Count Palatine, warden of Wadham College, Oxford (1648), and master (1659) of Trinity College, Cambridge. His interest in philosophy and science drew around him a distinguished circle of men, the nucleus of the Royal Society. Although at first parliamentary in his tendencies, Wilkins swore allegiance to Charles II., and became (1668) bishop of Chester. He is the author of *Discovery of a New*

World (1638); *Discourse concerning a New Planet* (1640); *Mercury, or the Secret and Swift Messenger* (1641); *Mathematical Magic* (1648); and *Essay towards a . . . Philosophical Language* (1668). See Henderson's *Life and Times of John Wilkins* (1910).

Wilkins, MARY ELEANOR, afterwards Mrs. FREEMAN (1862), American authoress, born at Randolph, Massachusetts; has written a number of popular novels, including *A Humble Romance* (1887), *Jane Field* (1892), *The Jamesons* (1894), *Pembroke* (1894), *Madelon* (1896), *Silence* (1898), *The Love of Parson Lord* (1900), *The Heart's Highway* (1900), *The Portion of Labour* (1901), *The Wind in the Rose Bush* (1903), *The Debtor* (1905), *Dr. Gordon* (1907), and *The Shoulders of Atlas* (1908).

Wilkins, PETER. See PALTOCK, ROBERT.

Wilkinsburg, bor., Allegheny co., Pennsylvania, U.S.A., 5 m. E. of Pittsburg; has planing mills and an ice plant. Pop. (1910) 18,924.

Wilkinson, HENRY SPENSER (1853), English publicist, born in Manchester. He has been Chichele Professor of Military History at Oxford since 1909. His works include *Citizen Soldiers* (1884), *Essays on the War Game* (1887), *Exercises in Strategy* (1887), *The Brain of an Army* (1890; new ed. 1895), *The Great Alternative* (1894), *The Command of the Sea* (1894), *The Brain of the Navy* (1895), *The Nation's Awakening* (1896), *British Policy in South Africa* (1899), *War and Policy* (1900), and *Britain at Bay* (1909); and edited *Twelve Soldiers* (1899), and *The Nation's Need, Chapters on Education* (1903).

Wilkinson, JAMES (1757-1825), American general, born near Benedict, Maryland, and served under Arnold in the Northern army. He was secretary of war, and

general-in-chief of the forces in Louisiana. Twice tried for dereliction of duty, he was in both cases honourably acquitted. He died in Mexico, where he wrote *Memoirs of My Own Time* (1816).

Wilkinson, JAMES JOHN GARTH (1812-99), English Swedenborgian, was born in London, where he set up practice as a homœopathic doctor. He was a mystic by temperament, and the influence of Blake's *Poems* is apparent in a volume of verses, *Improvisations from the Spirit* (1857). From 1839 he devoted his literary efforts to the translation and explanation of Swedenborg's writings, and won the friendship of Emerson, Carlyle, and others.

Wilkinson, SIR JOHN GARDNER (1797-1875), English explorer and Egyptologist, born in Westmorland; spent twelve years (1821-33) in Upper Egypt and Nubia, in travelling and making discoveries of buried tombs. On his return to England he was elected F.R.S., and knighted (1839). He made four subsequent journeys to Egypt in 1841, 1843, 1848, 1855; and in 1844 he travelled also through Montenegro and Bosnia. His principal works are *Materia Hieroglyphica* (1828), *The Topography of Thebes* (1830), *Manners and Customs of the Ancient Egyptians* (1837-41; new ed. 1879), *Modern Egypt and Thebes* (1844), *Architecture of Ancient Egypt* (1850), and *Egypt in the Times of the Pharaohs* (1857).

Will. All persons except lunatics and infants may now make a will, which must be in writing and signed by the testator, or by some other person in his presence and by his direction, at the foot thereof, in the presence of two or more witnesses, who must subscribe their names. If one of the attesting witnesses is a legatee, or the wife or husband of a legatee, the will is good, but the legacy is void.

Any alteration in a will must be attested as if it was a will. A will is *ipso facto* revoked by marriage; by a new will revoking the old one; or by the destruction of the will by the testator, or some person in his presence, with intent to revoke the same. A will speaks from the date of the testator's death, not from the date of the will. Thus, if A devises all his lands to B, the lands are ascertained at the testator's death, unless a contrary intention appears. A lost will, which is shown not to have been revoked, can be proved by oral evidence. All wills must be proved. If a will has an intelligible meaning, evidence that the testator meant something else will not be admitted; but if the will is ambiguous, evidence of the testator's intention is admissible. If words or changes are introduced into a will by accident, fraud, or mistake, without the testator's knowledge, they may be struck out. A devise may be void for uncertainty—*e.g.* a devise of some of my lands to A and some to B. By the Wills Act, 1861, a will made by a British subject out of the United Kingdom is good as to *personal* estate if it was made according to the forms either of the place where it was made, or of the place of the testator's domicile, or of his domicile of origin (being within the British empire). Soldiers on active service, and seamen at sea, including merchant sailors, may, when they have attained the age of fourteen, make a will of *personal property*, without any formality, and either by word of mouth or in writing signed or unsigned. But by the Navy and Marines (Wills) Acts, 1865 and 1897, in the case of a seaman (not an officer or engineer) in the royal navy, a will of wages or prize-money payable by the Admiralty must comply with the

Wills Act, and be attested by two officers, unless the testator is a prisoner of war, when the will must be attested by one officer or a notary public, or comply with the law of the place, or with the law of England; but the Admiralty may dispense with all formalities if they think fit.

In Scotland the word 'will' is not a technical legal term, but it is the popular name for any document by which a person legally disposes of his property after his death. Formerly, heritable property in Scotland could only be disposed of by a deed containing words of *de presenti* disposition, and a will, or testament (which is the technical term), could only dispose of movables. But by the Titles to Land Consolidation Act, 1868, sec. 20, heritable property can be disposed of by any testamentary or *mortis causa* deeds or writings. In England a man can freely dispose of his whole estate, real and personal, by will, without any regard to his wife or children; but in Scotland the widow has her *jus relictæ*, being one-third or a half of the movable estate, according as there are children or not, and the children their *legitim*, being another third or a half, according as there is a widow or not, and the husband can only dispose by will of the remainder, or 'dead's part,' unless by antenuptial contract power is given him to dispose of more. In Scotland a holograph will, or a will in the handwriting of the testator, requires no witnesses, but it must be signed. A legatee may be a witness to a will without losing his legacy. The commonest form of testamentary disposition in Scotland is a trust disposition and settlement. See LEGACY, NUNCUPATIVE WILL, and TRUST; also Jarman *On Wills* (6th ed. 1909), Theobald's *Law of Wills* (7th ed. 1908).

M'Laren on *Wills and Succession* (3rd ed. 1894).

WILL MAKING. The question of a subject's incapacity is often directly raised when it is proposed that a person should be declared unfit to exercise his legal rights, to require the shield of the law to protect his being imposed on, and to obtain special protection for his property. It is not an infrequent mistake to suppose that a person is necessarily incapacitated from making a will the moment he can be proved to labour under any condition to which the term insanity may be applied. A person is considered to be capable of making a valid will if he knows the nature of the act which he is performing and is fully aware of its consequences. Persons have made valid wills while inmates of asylums. It is an axiom of law that the validity of an act ought to be maintained in cases of insanity unless at the time the act was performed the state of mind of the agent can be shown to render him unfit to perform that particular act in a rational manner. The existence of delusions does not necessarily invalidate a will, for it has been held that the existence of a delusion is insufficient to overthrow a will unless the delusion was calculated to influence the testator in making it. On the other hand, a will may be invalidated on account of the existence of mental states which would not be regarded as insanity—*e.g.* failure of memory in old age.

The question of the mental capacity of a person to enter into a particular contract or to execute a particular will is frequently combined with allegations of undue influence exercised by those who benefit by the act. The inquiry has then, of course, to be pointedly directed to determining whether he was facile, unduly liable to persuasion,

easily incited to any view and feelings, and generally incapable of resisting pressure. The question of whether a man is in such a state of mind as to be capable of making a will is a question of fact and not of law. In these circumstances it is essential to keep in mind that a man may not be capable of any long-sustained mental exertion and yet may be quite capable, reasonably and fairly, of saying, I want my estate to go to A. B., or, I want to disinherit my heir, and to leave my estate to an hospital. As the late Lord President Inglis pointed out, that is not a very complex idea; and if a person is capable of distinctly understanding what it is that he is doing—is capable of expressing that purpose in intelligible language, and is capable of understanding the consequences and effects of what he does—then he is capable of making such a settlement.

Will, in psychology, means (1), when used in a wide sense, the whole impulsive or active side of consciousness. In the tripartite division of consciousness into intellect, feeling, and will, the term is so used. But psychologists are now inclining to use the more vague and general word *conation* in this sense, and will is then employed in a narrower sense to denote (2) that phase of consciousness on its active side which immediately precedes the overt action or movement. But of course such deliberate action is not the only type of voluntary action. The hasty or impulsive action as expressing the agent's conscious attitude at the time, is also voluntary, though no doubt a less adequate and reliable expression of his will than a more deliberate act would have been. The determination of the nature, limits, and degrees of the voluntary and the involuntary becomes in this connection a matter not only of

theoretical or psychological interest, but of the most direct practical or legal importance. The classical discussion is that contained in book iii. of Aristotle's *Ethics*, where he defines all action as voluntary in which the agent is not hindered or compelled by external force, and is not misled by any inevitable ignorance or misapprehension as to the particular circumstances of the case. Psychologists of one school insist on regarding conation or will as a constituent or element in consciousness distinct from and not reducible to intellect and feeling, and some even regard will as the most fundamental characteristic of conscious process. The tendency, however, of the greatest philosophical thinkers has always been rather to minimize the distinction between intellect and will, and to regard the latter as intelligence directed to and expressed in action. This psychological question stands in close connection with the ethical and metaphysical controversy as to the freedom of the will. A great part of the difficulty of this controversy is unquestionably due to the confusion of several distinct issues under one vaguely conceived alternative of freedom or necessity. When we speak of a man as a free agent, we may mean simply that he is not withheld from action by any external cause—that he is neither a prisoner nor a slave, nor paralyzed, nor otherwise disabled. Next we may apply the term free to the internal or psychological decision, which he is externally free to carry out. In this sense the freedom of an action evidently consists in the fact that the action proceeds from the intelligent choice of the agent, and such choice is plainly and strongly contrasted with the mechanical determination which obtains in

the physical world. But when the mechanical view is extended—as on account of its abstract simplicity it very naturally tends to be—from the physical world, where it is appropriate, to mental process, where it is not, choice comes to be conceived as itself the outcome of a *psychical* mechanism, and the very contrast on which the whole meaning of freedom as applied to human action depends is obliterated. The confusion thus introduced into the discussion becomes complete when the defenders of freedom, instead of repudiating the mechanical analogy altogether, admit it as generally applicable, but reserve a mysterious faculty of will or volition to enable them to evade the logical consequences of their own admissions. Hence the futile controversy between a mechanical determinism on the one hand, and what is essentially a no less mechanical indeterminism on the other. The notion of freedom is further used in a sense which is not psychological at all, but ethical, when the good man is said to be free from the bondage of the lower nature, or the apostle's 'spiritual man' to be free from the bondage of the flesh and sin. And this is often characterized as the true freedom. From the new confusion between such moral freedom and freedom in the ordinary psychological sense, philosophers themselves have not been exempt, Kant's ethics in particular being much involved in it. Perhaps the best treatment of the whole subject is that given in T. H. Green's essay 'On the Different Senses of Freedom' (*Works*, vol. ii, 1885-8). Will is also used in a metaphysical sense in a system like Schopenhauer's to denote the world-principle, when conceived as being of a nature to which human will is analogous, or of which human will is a manifes-

tation. See his *World as Will and as Idea* (Eng. tr. 1891-6).

Williaert, ADRIAN (c. 1480-1562), founder of the Venetian school of musical composers, was born at Bruges in Belgium. In 1527 he was appointed music-master of St. Mark's, Venice. He was a prolific composer of motets and madrigals, and is regarded as the creator of the madrigal and the double chorus.

Willard, FRANCES ELIZABETH (1839-98), American author and reformer, born at Churchville, near Rochester, New York. She gave her early life to teaching, and became president of the Women's College at Evanston and professor of aesthetics in the university there. In 1874 she resigned this office to devote herself to temperance work. Her works include *Hints and Helps in Temperance Work* (1875); *Women and Temperance* (1883); *Women in the Pulpit* (1888); *My Happy Half-Century* (1894); *A Wheel within a Wheel* (1895); and *Do Everything* (1895). See Witts's *Frances E. Willard* (1898).

Willcocks, SIR JAMES (1857), British soldier, born in Delhi. He first saw service in the Afghan war of 1879-80, and afterwards took part in the Waziri expedition (1881), the Sudan campaign (1885), the Burmese expedition (1886-9), and the Chin-Lushai expedition (1889-90). He was with the punitive expedition to Manipur in 1891, and with the Tochi field force, under Sir W. Lockhart, in 1897. His next service was in Nigeria (1897-8). Two years later he was called upon to suppress the rebellion in Ashanti, and to relieve Kumassi, for which he was created K.C.M.G. From 1902-7 he commanded the Nowshera Brigade, India, and in 1908 the Zakka Khel expedition. He has published *From Kabul to Kumassi* (1904).

Willebroeck, comm., Bel-

gium, 10 m. s. of Antwerp. Pop. 11,800.

Willems, FLORENT (1823-1905), Belgian genre painter, born at Liège. In 1844, he exhibited his first success—*Visit to a Young Mother*—in Paris, and that city thereafter became his home. Among his works, mostly domestic scenes of the 16th and 17th centuries, may be mentioned *Three Ages of Man*, *Adorning the Bride*, *Lady with Lapdog*, and *Woman with the Spinning Wheel*. He also restored Raphael's *St. John the Baptist*.

Willemstad, tn., cap. of island of Curaçoa, Dutch W. Indies, on s. coast; has trade in sugar, tobacco, and phosphate of lime. Pop. 10,000.

Willenhall, urban dist., Staffordshire, England, 3 m. E. of Wolverhampton. Its industries include coal-mining and the manufacture of bolts, bicycle castings, and locks. Pop. (1911) 18,858.

Willesden, urban dist. and par., in the Harrow parl. div. of Middlesex, England, lying immediately outside of the boundary of the co. of London, and 7 m. N.W. of St. Paul's. There are large railway works at Willesden Junction, where the suburban lines of the London and North-Western, North London, and Great Western Rys. connect with the main line of the London and North-Western. Pop. (1911) 154,267.

Willet (*Totanus* or *Symphemia semipalmatus*), an American sandpiper, which occasionally strays to Europe.

William I., called the CONQUEROR (1027-87), king of England, was the bastard son of Robert the Devil, Duke of Normandy, and of Arlette, the daughter of a tanner of Falaise, where he was born. He succeeded his father as duke in 1035, but was not thoroughly established in power

until 1047. Edward the Confessor, his cousin, is said to have offered him the succession to the crown of England in 1051. In 1064 Harold of Wessex also recognized the Norman duke's pretensions to the English crown. When, however, Edward the Confessor died, Harold refused to be bound by a promise which, he said, was extorted from him, and seized the throne. In consequence of this, William invaded England, and defeated and slew Harold at the battle of Senlac. William then gradually forced all England to recognize his royal title. Till 1072 he was constantly engaged in putting down risings of the English, and in driving back Malcolm III. of Scotland. At last, by thoroughly devastating the north of England; by inducing Hereward the Wake, who had held out on the Fens, near Ely, to make peace; and by forcing Malcolm III. to submit at Abernethy (1072), William was able to regard the conquest of the country as completed. But in 1074 Roger, Earl of Hereford, and Ralph, Earl of Norfolk, rose, and inaugurated a struggle between feudalism and the crown, which lasted intermittently for a hundred years. The suppression of the revolt was followed by another rising in 1077, in which Robert, William's eldest son, took a leading part. In order to establish a strong centralized government, William reformed the church in England, and then increased its power and its independence of the barons by setting up separate ecclesiastical courts, and by introducing a number of able and learned administrators, such as Lanfranc, archbishop of Canterbury. As a further check on the barons, he kept up the hundred and shire courts; he made the sheriffs royal officers, dependent on himself; he preserved the Anglo-

Saxon *fyrd* (local 'militia'); he caused Domesday Book to be drawn up; he compelled all land-owning men to take an oath of fealty to himself at Salisbury (1086). See Freeman's *History of the Norman Conquest* (1867-79) and *William the Conqueror* (1888).

William II., called **RUFUS** (?1056-1100), king of England, succeeded his father in 1087. He had ability, but his nature was unrestrained and savage. He had no respect for religion or for the church. William put down, in 1087, a rebellion headed by Odo, bishop of Bayeux, and in 1091 secured Normandy, which Robert, his elder brother, had sold to Henry, his younger brother. An invasion of England by Malcolm III. (Canmore) led William to invade Scotland and to annex Cumberland, which he peopled with English and Flemings. A second invasion by Malcolm resulted in his death in 1093 at Alnwick. Meanwhile William had attempted the conquest of Wales, but had to content himself with building castles on the Welsh frontier, and colonizing part of Southern Wales with French, Flemish, and English settlers. In 1095 a revolt of Robert of Mowbray, Earl of Northumberland, led to the capture of the castle of Bamborough, and the beginning of the policy of confiscation, which gradually lessened the power of the great nobles. William was equally successful in seizing Maine. A long quarrel with Anselm, the successor of Lanfranc, archbishop of Canterbury, arose out of the recognition of a pope. Though technically right, William damaged his cause by his violence and avarice. Anselm left the country (1097). William was slain while hunting in the New Forest. See Freeman's *History of the Norman Conquest* (1867-79) and *The Reign of William Rufus* (1882).

William III. (1650-1702), king of Great Britain and Ireland, was the son of William II. of Orange, ruler of the United Provinces. In 1672 he helped to effect the deliverance of his country from the French. From that time he became the leading opponent of Louis XIV. and the principal supporter in Europe of the balance of power. In 1677 he married Mary, daughter of James, Duke of York, who in 1685 became king of England as James II. In 1688 William was invited by seven Whig peers to deliver England from the Stuart misrule. After the flight of James II. to France, the crown was offered to William and Mary. The Bill of Rights defined their powers, and the Mutiny Act made Parliament supreme. The battle of the Boyne (July 1, 1690), followed by the treaty of Limerick in 1691, ruined the chances of James in Ireland, and the death of Dundee, who won the battle of Killiecrankie for James in 1689, ruined the Stuart cause in Scotland, though William's success was marred by the deplorable massacre of Glencoe in 1692. On May 19, 1692, the English naval victory of La Hogue ruined all chance of direct aid to James from France. On the Continent the French armies were successful. In August 1692 William III. was defeated at Steinkirk, and later at Landen; and though in 1695 he retook Namur, he could win no decisive victory against the French, and in 1697 England, France, Holland, and Spain agreed to the peace of Ryswick. In 1694 Queen Mary died. From 1697 to 1700 William was occupied with the Spanish Succession question, but died before the outbreak of the war. During his later years he had been opposed in Parliament, and had been obliged to cancel his grants of Irish lands to certain of his friends;

the Whig leaders had been impeached; and in the Act of Settlement, passed in 1701, the Tories had imposed fresh checks on the royal power. In Scotland the failure of the Darien scheme had made the English government more unpopular than ever. William's reign marked the transition from the personal government of the Stuarts to the parliamentary rule of the Hanoverians. See Macaulay's *History of England*, Ranke's *History of England, principally in the 17th Century* (1859-67), and Traill's *William III.* (1888).

William IV. (1765-1837), king of Great Britain and Ireland, was born at Windsor, the third son of George III., and succeeded his brother George IV. in 1830. He was popular with the nation owing to his genial and simple character, and his sympathy with Liberal principles. After a long struggle the Reform Bill was carried in 1832, though William IV. had latterly adopted an anti-reform attitude. The emancipation of the slaves, the renewal of the Bank Charter, the settlement of the East India Company, were all beneficial measures which marked the reign of William IV. The foreign policy of Lord Palmerston placed England in a foremost position among foreign nations. William IV.'s reign saw the ascendancy of the middle classes in England. In his early life William IV. lived with the actress Mrs. Jordan. See Spencer Walpole's *History of England* (1878-86), Buckingham's *Courts and Cabinets of William IV.* (1861), Greville's *Memoirs* (1875-87), and P. Fitzgerald's *Life and Times of William IV.* (1884).

William the Lion (1143-1214), king of Scotland, a grandson of David I., succeeded his brother Malcolm IV. in 1165. Malcolm IV. had been compelled by the English king, Henry II., to give up Northumberland, Cum-

berland, and Westmorland, which David had held, and to acknowledge Henry's feudal superiority. William the Lion was in 1173 won over to the cause of the rebellious English barons by the offer of Northumberland. The rebellion, however, failed, and William was captured at Alnwick by the sheriff of Yorkshire. By the treaty of Falaise he was compelled to hold Scotland as a vassal of the English king, and as security to hand over the castles of Edinburgh, Stirling, Roxburgh, Jedburgh, and Berwick. But Richard I., for 10,000 marks, restored the castles of Roxburgh and Berwick to William, and released him and his heirs from doing homage to the English kings. William built the abbey of Arbroath in 1178 in memory of Thomas à Becket.

William I. (1797-1888), king of Prussia and German emperor, was the son of Frederick William III. of Prussia, and was born at Berlin. He first saw service in the war of liberation against Napoleon I., and for his gallantry in the 1814 campaign in France received the iron cross. His reactionary sympathies at the time of the revolution of 1848 in Berlin made him very unpopular, and he was compelled to take refuge in England. In 1858 the mind of the king, Frederick William, gave way, and Prince William became regent. In the beginning of 1861 William succeeded to the throne of Prussia. In September 1862 he called Bismarck to office, and in 1863 the Schleswig-Holstein question came to the fore, and embittered the relations of Austria and Prussia. In 1866 the Austro-Prussian war broke out, and at the conclusion of the war the Prussian ascendancy in Germany was assured. The war of 1870-1 completed the triumph of William I. (see FRANCO-GERMAN

WAR). On Jan. 18, 1871, in the palace of Versailles, William was chosen German emperor. William's honesty and sagacity made him universally popular. See A. Forbes's *Life of the Emperor William* (1889), Oncken's *Das Zeitalter des Kaisers Wilhelm* (1892), Schmidt and Otto's *Kaiser Wilhelm und seine Zeit* (1888). See also PRUSSIA and GERMANY.

William II. (1859), king of Prussia and German emperor, was born at Berlin, and in 1888 succeeded his father, the Emperor Frederick III. From the day of his accession he resolved to be his own master, and in 1890 Bismarck was requested to resign his chancellorship. Anxious to extend the colonial possessions of Germany, William II. has lost no opportunity of entering upon the work of expansion, and this has had the effect of leading to a concentration of British energy in S. African affairs which it was largely the policy of the German government to prevent. These matters and later utterances by the emperor gave rise to much unfriendly feeling between the two countries, an estrangement which it has taken years to modify, and which has not yet entirely passed away. The collapse of Russia in her war with Japan has relieved Germany of all fear of a Russian attack, and has strengthened her position immensely in the political world. William II. is a great believer in the divine right of kings, and by temper and tradition is a thorough autocrat. His untiring energies are expended in many diverse ways. In addition to his great military and naval passions, he takes great interest in sport, is an excellent shot, a keen yachtsman, a preacher, a poet, and a painter, and has a lively enthusiasm for many branches of literature; while his striking and emphatical speeches show considerable rhetorical power.

Perhaps the most useful work effected during the emperor's reign has been the formation of a powerful fleet, and he may well be termed the founder of the German navy. The growth of the Socialist Democratic party in Germany has caused him much anxiety. See Lowe's *The German Emperor* (1895); Noussanne's *William II.* (1905); *William II. of Germany* (1904).

William the Silent, Prince of Orange (1533-84), son of the Count of Nassau, was born at Dillenburg in Nassau, and succeeded in 1544 to the principality of Orange. Charles V. appointed him governor of Holland, Zeeland, Utrecht, and West Friesland, and sent him on several diplomatic missions. Philip II. on his accession accused William of Orange of stirring up the States-general against the royal measures. In 1561 William definitely headed the opposition in the Netherlands to Philip, and urged the regent, Margaret of Parma, to carry out certain necessary reforms. In 1567 William retired to Nassau and watched the course of events. An attempt to overthrow the Spanish governor, Alva, failed, and the co-operation of the French with the rebels ceased after the massacre of St. Bartholomew in 1572. In 1578 William and the Archduke Matthias were defeated by the Spanish troops at Gembloux. William then induced the Roman Catholic provinces to make the union of Arras in January 1579, and to leave the Protestant provinces, which at once formed the union of Utrecht. But William was himself assassinated. He was a great man; and to his patience, perseverance, and skill, the Dutch republic, as the seven united provinces were termed, owed its independence. As a statesman and diplomatist he occupies a foremost place

among his contemporaries. See Ruth Putnam's *William the Silent* (1911), and F. Harrison's *William the Silent* (1897).

William I. (1772-1843), king of the Netherlands, the son of William V., the last hereditary stadtholder. He commanded the army of the Netherlands against France from 1793 until the subjection of the Netherlands in 1795. After that he joined the army of Prussia, and served as a general until his capture by the French at Jena (1806). He also served in the Austrian army—*e.g.* at Wagram (1809). On the downfall of Napoleon, and the subsequent adjustment of European affairs, the Congress of Vienna decided that Belgium and Holland should be united under one sovereign, William I. He reigned till 1840, when he resigned in favour of his son William II.

William II. (1792-1849), king of the Netherlands. In the Napoleonic wars he fought with Wellington in Spain, and commanded the Dutch army at Waterloo. On the revolt of the Belgians (1830), contrary to the wishes of his father, he acquiesced in the independence of Belgium. Two years later he commanded the army of the Netherlands against the Belgians, until defeated by the French (1832).

William IX. (1071-1127), duke of Aquitaine and count of Poitou, Provençal poet. He seized the territory of Raymond IV. when he was absent at the crusades; he afterwards joined (1101) the crusaders himself, with the duke of Bavaria, but was entrapped by Alexis, emperor of Constantinople. William saved himself by flight, and took refuge with the prince of Antioch, whom he accompanied to Jerusalem. On returning home he assisted the king of Aragon against the Moors, over whom a victory was

obtained at Cordova. He afterwards assisted Louis the Fat in his campaign against the Germans (1124). He was also a celebrated Provençal poet. His *Poésies* are printed in Mahn's *Die Werke der Troubadours*, vol. i. (1846). See Palastre's *Histoire de Guillaume IX, dit le Troubadour* (1882).

William of Champeaux (d. 1121), French scholastic philosopher, was born at Champeaux, near Melun. He studied at Paris, where he formed a school, among his pupils being Abelard. In 1113 he was made bishop of Châlons-sur-Marne. He wrote several theological works.

William of Jumièges. See JUMIÈGES.

William of Lorris. See LORRIS, GUILLAUME DE.

William of Malmesbury. See MALMESBURY.

William of Nassau. See WILLIAM THE SILENT.

William of Newburgh (1136-?98), English historian, was born in Yorkshire, and spent all his life at the Augustinian monastery of Newburgh. He is the author of the best historical work left to us from the 12th century, and the spirit of it is manifest from his denunciation of the fables set forth by Geoffrey of Monmouth. Although his dates are not to be accepted without corroboration, he well deserves Freeman's praise as 'the father of historical criticism.' Editions of his *History* appeared in the Rolls Series (1834), and for the English Historical Society (1856).

William of Occam. See OCKHAM.

William of Orange. See WILLIAM THE SILENT, and WILLIAM III. OF ENGLAND.

William of Poitiers (c. 1020), chronicler. After acting as chaplain to William the Conqueror, he was appointed archdeacon of Lisieux, and devoted himself to philosophy, mathematics, and

history—especially to the compilation of his *Gesta Guillelmi Ducis Normannorum et Regis Anglorum*.

William of Shoreham, English religious poet, was born at Shoreham, and became a monk of the priory of Leeds and vicar of Chart-Sutton (1320). He translated the Psalms of David into English prose about 1327, and wrote a number of religious poems, edited for the Percy Society in 1849 by Thomas Wright, and for the Early English Text Society by Konrath in 1902. See Konrath's *Beiträge zur Erklärung und Text-Kritik des W. von Schorham* (1878).

William of Tyre (c. 1137-83), mediæval historian, was English by birth. After being prior of the Holy Sepulchre at Jerusalem, he was consecrated (1175) archbishop of Tyre. His *Historia* was translated into French (ed. by P. Paris, 1879-80).

William of Wykeham. See WYKEHAM.

William and Mary College, at Williamsburg in Virginia, U.S.A., received a charter (1693) from William and Mary.

Willamette, riv., Oregon, U.S.A., a trib. of the Columbia R., which it joins a few miles N. of Portland. Length, 300 m. The towns of Portland, Salem, and Albany are on its banks.

Williams, EDWARD (1746-1823), Welsh bard, was born in Glamorganshire, and became a land-surveyor. He is known by his bardic name of Iolo, and was active in the collection and publication of Welsh MSS.—*Myvyrian Archaeology* (1801), and *Iolo MSS.* (1848).

Williams, SIR GEORGE (1821-1905), English philanthropist, was born at Dulverton, Somersetshire. In 1841 he went to London and entered into business at St. Paul's Churchyard, where he remained for over sixty years. He was the

originator of the Young Men's Christian Association in 1844, and in the development of which, and in that of the Band of Hope Union, his great interests lay. His house, 13 Russell Square, London, was given by his sons to the National Council of the Y.M.C. Associations as the future headquarters of the movement. Williams was knighted in 1894. See *Life* by A. E. H. Williams (1906); also YOUNG MEN'S CHRISTIAN ASSOCIATION.

Williams, ISAAC (1802-65), Welsh poet and theologian, was born near Aberystwith, and became (1831) fellow of Trinity College, Oxford. His poems and prose writings are chiefly devotional, among the former being *The Cathedral*, *The Christian Seasons*; and among the latter, *Devotional Commentary on the Gospel Narratives*, *The Apocalypse*, and sermons. Williams's religious views were of the Tractarian school, and he was the author of the celebrated tract, *Reserve in communicating Religious Knowledge*. See his *Autobiography* (1892).

Williams, JOHN (1796-1839), English missionary, was born at Tottenham, near London, and in 1816 accepted by the London Missionary Society as a missionary to the Society Is. in the Pacific. Here Williams introduced a code of laws, encouraged the cultivation of the sugar-cane and tobacco, and instructed the natives in printing and in house-building. This missionary work was also extended to the Cook Is., to Rarotonga (Harvey Is.), to Samoa, and to the Friendly Is. He was killed on the cannibal island of Erromanga (New Hebrides). He wrote *Narrative of Missionary Enterprises in the South Sea Islands* (1837). See Prout's *Memoir* (1843), and Campbell's *Martyr of Erromanga* (1842).

Williams, SIR MONIER MONIER- (1819-99), English Orientalist, was born at Bombay; was professor of Oriental languages at Haileybury (1844-58); taught Sanskrit at Cheltenham (1858-60); and became Boden professor of Sanskrit at Oxford (1860). He was fellow of Balliol College, Oxford (1882-8); keeper and curator of the Indian Institute (1883) at Oxford; and was knighted in 1887. His *Sanskrit Dictionary* (1851-72), and edition of *Sakuntala* (1853), *Indian Epic Poetry* (1873), and *Indian Wisdom* (1875), are of high authority. He also wrote *Religious Life and Thought in India* (1883), and on Buddhism (1889), Brahmanism (1889), Hinduism (1877, 1889).

Williams, ROGER (?1600-83), founder of the state of Rhode I., U.S.A., and the apostle of civil and religious liberty in America, was born in Wales. He became a nonconformist minister, and sought an asylum in America, in 1631, and became an assistant minister at Salem, and later at Plymouth. In 1633 he became chief pastor at Salem, but was driven from his charge for his 'new and dangerous opinions against the authority of magistrates.' He then founded the city of Providence, Rhode I. Here he became a Baptist, and founded a church. In 1643 he sailed for England to procure a charter, and in 1651 again visited England to secure the confirmation of his charter, and then became intimate with Vane, Milton, and Cromwell. In 1654 he returned as president of the colony of Rhode I., an office which he held till 1658. He wrote *Key into the Language of the Indians of America* (1643), *The Hiring Ministry none of Christ's* (1652), and *Experiments of Spiritual Life and Health* (1652). His *Works* were published in 6 vols. in 1866-74. See *Life* by Guild (1866) and

Dexter (1876), and Guild's *Account of the Writings of Roger Williams* (1862).

Williams, ROWLAND (1817-70), Welsh Anglican divine, was born in Flintshire. Whilst vice-principal and professor of Hebrew at St. David's, Lampeter (1850-62) he organized many reforms. He is the author of the standard work *Christianity and Hinduism* (1856). His *Rational Godliness after the Mind of Christ* (1855), a 'Review of Bunsen's Biblical Researches' in *Essays and Reviews* (1860), and *Broad Chalke Sermon-Essays* (1867), all set forth the liberality of his doctrinal views, which brought against him accusations of heresy. See *Life and Letters*, by his wife (1874).

Williams, SAMUEL WELLS (1812-84), American Orientalist, born at Utica, New York, and went to China (1833) as a printer for the missionary board at Canton. He learned Japanese, and made a version of Genesis and St. Matthew in that language. He wrote *Easy Lessons in Chinese* (1841), *An English and Chinese Vocabulary* (1843), *A Chinese Commercial Guide* (1844), *The Middle Kingdom* (1848), and *Tonic Dictionary of the Chinese Language* (1856). In 1858 he assisted in the negotiations at Tientsin.

Williams, SIR WILLIAM FENWICK (1800-83), British general, was born at Annapolis, Nova Scotia. In 1854, on the outbreak of the Crimean war, he was appointed British commissioner with the Turkish army in Asia Minor, and practically became its commander-in-chief. He was besieged in Kars by the Russians from June 7 till Nov. 28, 1855, when he capitulated with the honours of war. He was created a baronet in 1856, and made a general in 1868.

Williamsburg, city, Virginia, U.S.A., between the James and

York Rs., 48 m. s.e. of Richmond; has oyster fishing. It was the seat of the government of Virginia (1705-9). It contains the William and Mary College (1693), which is, next to Harvard, the oldest of American colleges, and the Eastern State lunatic asylum. Pop. (1910) 2,714.

Williams College, at Williamstown, Massachusetts, U.S.A., was founded (1793) in accordance with the will of Colonel Ephraim Williams. It is under Congregational control, and has always been famed for its teaching of science, the first observatory erected in the United States having been placed here in 1838.

Williamson, ALEXANDER WILLIAM (1824-1904), English chemist, was born at Wandsworth, London, and studied chemistry, first under Gmelin at Heidelberg, and afterwards with Liebig at Giessen. In 1849 he was appointed professor of practical chemistry in University College, London, succeeded Graham in the chair of chemistry there in 1855, and retired in 1887. Williamson's principal work was in extending the theory of types, and on the theories of etherification and electrolysis. He was foreign secretary of the Royal Society (1873-89).

Williamson, FRANCIS JOHN (1833), English sculptor, born at Hampstead, near London, was assistant to J. H. Foley for twenty years. He has executed busts or statues of nearly every member of the royal family; also statues of Queen Victoria for London, Australia, and India, the memorial to Princess Charlotte at Clarence House, and the memorial to Dean Milman in St. Paul's Cathedral—one of his best works.

Williamson, PETER (1730-99), Scottish author and publisher, was born at Aboyne in Aberdeenshire, and when ten years of age was kidnapped and sold in the plantations in America. After

he became his own master he was captured by Indians, escaped and enlisted in the British army, and in 1757 was discharged at Plymouth. He published an account of his experiences, and settled in Edinburgh as bookseller, printer, and tavern-keeper. He issued (1776) a periodical in the style of the *Spectator*, called the *Scots Spy*, and the first street *Directory of Edinburgh* (1773). He also instituted a penny post, which was ultimately taken over by the government (1793).

Williamson, WILLIAM CRAWFORD (1816-95), English naturalist, was born at Scarborough, and became curator of the museum of the Manchester Natural History Society (1835). In 1851 he was appointed professor of natural history in Owens College, Manchester, and held the post till 1892. The studies of the fossil plants of the Coal Measures, published in *Phil. Trans. of Royal Society* (1871-93), are the work by which his fame was established. See his autobiographical *Reminiscences of a Yorkshire Naturalist* (1896).

WilliamSPORT, city, Pennsylvania, U.S.A., co. seat of Lycoming co., on the w. branch of the Susquehanna, 70 m. N. of Harrisburg. The principal manufactures are fire-engines, sewing-machines, gas-engines, lumber, rubber, silk, and clothing. Pop. (1910) 31,860.

Williamstown, tn., Bourke co., Victoria, Australia, on the s. point of the estuary of the Yarra-Yarra and s.w. shore of Hobson's Bay, immediately opposite Port Melbourne. There are railway shops and shipbuilding. Pop. 15,000.

Willibald, ALEXIS. See **HARING**, G. W. H.

Willibrord, SAINT (657-736), apostle to the Frisians, was born in Northumbria, and spent twelve years (677-690) in an Irish monastery, until sent in 690 to preach

to the Frisians. See *Life* by Alberdingk-Thijm (1863).

Willich, vil., Rhenish Prussia, 5 m. s. of Crefeld. Pop. (1910) 6,481.

Willmantic, tn., Windham co., Connecticut, U.S.A., 25 m. E.S.E. of Hartford; has manufactures of cotton thread, paper, silk and woollen goods. Pop. (1910) 11,230.

Willington, urb. dist., England, co. of and 7 m. s.w. of Durham, and on the Wear; has large collieries and whinstone quarries. Pop. (1911) 8,734.

Willington Quay, par. and tn., Northumberland, England, on the Tyne, 2 m. s.w. of North Shields. There are shipbuilding works, copper smelting, lead, firebrick, and rope-making works. Pop. 7,000.

Willis, NATHANIEL PARKER (1806-67), American author, born at Portland, Maine; first attracted notice with his *Pencilings by the Way* (1831). He contributed as foreign correspondent to the *New York Mirror* (1835). His *Slingsby Papers*, republished as *Inklings of Adventure* (1836), added to his fame. While in England he published a volume of verse, *Melaine and other Poems* (1835), which achieved success. His most notable works are *Life Here and There* (1850), *Outdoors at Idlewild* (1854), *Paul Fane* (1857). His collected *Poems* appeared in 1867, and a selection from his *Prose Writings* in 1885. See *Life* by H. A. Beers (1885).

Willis, ROBERT (1800-75), English inventor and archaeologist, was born in London. He became Jacksonian professor of applied mechanics in Cambridge University (1837). Among his principal works are *System of Apparatus* (1851); *Principles of Mechanism* (2nd ed. 1870); *Remarks on the Architecture of the Middle Ages* (1835); *The Architectural History of the Monastery of Christchurch, Canterbury* (1839), and histories of many of the English cathedrals.

He left incomplete an *Architectural History of the University of Cambridge and of the Colleges of Cambridge and Eton*, completed (4 vols.) by J. W. Clark (1886). Willis was the inventor of the cymograph and the odontograph.

Willis, THOMAS (1621-75), English physician, was born in Wiltshire. He practised at first in Oxford, where he was a zealous churchman and king's man during the whole period of the rebellion. In 1660 he was appointed professor of natural philosophy, and in 1666 settled in London to practise medicine. In 1664 he published the results of his anatomical studies, giving the most exact account of the nervous system which had then appeared, and by his urine analysis he is credited with the discovery of diabetes mellitus. In 1682 a collected edition of his Latin works was published.

Willis's Rooms. See AL-MACK'S.

Will-o'-the-Wisp, or **IGNIS FATUUS**, a luminous meteor, generally of a pale bluish colour, seen over marshes and graveyards; it is supposed to be due to gases emanating from decaying vegetable or animal matter. Other names are 'Jack-a-lantern' and 'corpse candle.'

Willoughby, suburb of Sydney, New South Wales, 5 m. N.; with market gardens, cornflour mill, tanneries, and potteries. Pop. 6,000.

Willoughby, or **WILLUGHBY**, **FRANCIS** (1635-72), English naturalist, was born in Warwickshire. In company with Ray he made a long scientific sojourn on the Continent (1663-5). The result of his studies was published posthumously by Ray as *The Ornithology of Francis Willoughby* (1678), *Historia Piscium* (1686), and (completed by Ray) the *Historia Insectorum* (1710). Ray's posthu-

mous *Synopsis Metholica Avium et Piscium* (1713) is also largely based on Willoughby's work.

Willoughby, SIR HUGH (d. 1554), English navigator, was chosen in 1553 to lead a trading expedition to China on behalf of the Company of Merchant Adventurers. He had with him Richard Chancellor, and chose the north-east route, but perished with his crews on the coast of Lapland.

Willow, a name given to a number of species of trees, many of which are natives of Britain. They are mostly characterized by their smooth, polished bark; by their long, slightly-notched leaves; and by their silky, erect, barren catkins. They grow readily and rapidly from cuttings. The goat willow, or sallow, grows to some forty feet in height, and bears a profusion of handsome catkins in spring. The Bedford, or Russell's, willow is a large-growing species, and is very quick in attaining to maturity. The white, or Huntingdon, willow is also a very rapid grower. Willows thrive in moist ground, especially by the sides of rivers or ponds.

Willow Herb, a term applied to certain plants belonging to the order Onagraceæ. Among the species native to Britain is the great hairy willow herb, which occurs commonly in wet situations. It grows to six feet in height, and has woolly or downy stems and leaves. In late summer it bears large rose-coloured flowers. The small-flowered hairy willow herb is also common. The broad smooth-leaved willow herb is generally found on dry ground or hilly places. It is quite a small plant, with dentate ovate leaves and rose-coloured flowers, followed by long, valved capsules, containing bearded seeds.

Willowmore, tn., Cape of Good Hope, 185 m. by rail w.n.w. of Port

Elizabeth. Mohair, wool, and ostrich feathers are the chief products of the district. Pop. 3,600.

Willow Moth (*Caradrina quadripunctata*), a member of the British Noctuidæ, whose caterpillar attacks grain.

Willow-wren. See WARBLERS.

Wills, WILLIAM GORMAN (1828-91), Irish dramatist, born at Kilmurry, and in 1862 settled in London, where he took to portrait-painting; but was more successful when he turned his attention to the drama. His best known plays are *Charles I.* (1872), *Eugene Aram* (1873), *Marie Stuart* (1874), *Sappho* (1875), *Jane Shore* (1876), and *Olivia* (1873), the first and last of which found a permanent place in the Lyceum theatre repertory. The only other of his plays that stand out at all prominently are *Claudian* (1883) and a version of *Faust* (1885), the latter revived in 1902. He was considerably gifted with the dramatic instinct. There is a *Life* by his brother (1898).

Wills, WILLIAM JOHN (1834-61), Australian explorer, was born in Devonshire, England, and in 1853 emigrated to Australia. He became connected with the Crown Lands Department, and in 1860 was appointed a member of a scientific exploring expedition sent out under Robert O'Hara Burke to discover a route to the north across Australia. The expedition left Melbourne in 1860, crossed the Australian continent to the Gulf of Carpentaria, but Wills and all the other members of the expedition, except King, died of starvation whilst trying to return to Adelaide. His *Journal* was edited by his father (1863).

Wills's Coffee House, London, a famous convivial resort, was in Russell Street, at the end of Bow Street. It first bore the title of the Red Cow, then of the Rose. Dryden was

the first to make Wills's the resort of the wits of his time, and it was for long the open market for libels and lampoons. After Dryden's death (1700) the house was patronized by, among others, Pope. About 1712 the custom was transferred by Addison to Button's coffee house, on the opposite side of the street. See Timbs's *Club Life in London*, vol. ii. (1866).

Wilmerding, tn., Pennsylvania, U.S.A., in Allegheny co., 14 m. E.S.E. of Pittsburgh; manufactures Westinghouse air-brakes. Pop. (1910) 6,133.

Wilmington. (1.) City, Delaware, U.S.A., co. seat of New Castle co., 28 m. S.W. of Philadelphia. It manufactures leather, machinery, railway carriages, iron and steel goods, and has shipbuilding. The old Swedes' Church, now Holy Trinity, which was built in 1698, is said to be the oldest building in the United States which has been in continuous use as a church since its erection. Pop. (1910) 87,411. **(2.)** City, N. Carolina, U.S.A., co. seat of New Hanover co., on Cape Fear R., 30 m. from the Atlantic; is one of the shipping ports of the south. In 1910 the imports were valued at £520,978, and the exports, practically all cotton, at £5,709,326. Pop. (1910) 25,748.

Wilmot, DAVID (1814-68), author of 'the Wilmot proviso,' born in Bethany, Pennsylvania, and practised law at Towanda. Elected a member of Congress, while a bill was pending to apply two million dollars for the purchase of a part of Mexico, he moved (Aug. 8, 1846) an amendment, 'That....neither slavery nor involuntary servitude shall ever exist in any part of said Mexican territory.' This was adopted by Congress, but rejected by the Senate. Wilmot was appointed (1863) a judge of the United States Court of Claims.

Wilmslow, urb. dist., Cheshire, England, 7 m. N.W. of Macclesfield. Its industries are similar to those of Manchester and Stockport. Pop. (1911) 8,153.

Wilna. See VILNA.

Wilsden, par., W. Riding, Yorkshire, England, 5 m. N.W. of Bradford; has manufactures of worsted and worsted goods. Pop. reg. dist. (1911) 2,958.

Wilson, tn., North Carolina, U.S.A., co. seat of Wilson co., 100 m. N. of Wilmington; manufactures tobacco, cotton, lumber, wagons, and fertilizers. Pop. (1910) 6,717.

Wilson, ALEXANDER (1766-1813), Scottish ornithologist, was born at Paisley. Brought up as a weaver, he was fond of books and nature. Going to America in 1794, he, as weaver, peddler, and sometimes schoolmaster, made a precarious livelihood for about eight years, but collected specimens of the rare birds of America. In 1808-13 he published his *American Ornithology*, the plates of which were all drawn, etched, and coloured by his own hand. The book was continued by C. L. Bonaparte (1828-33); new ed. by Sir W. Jardine (3 vols. 1832). See *Lives* by Ord (1828) in Jared Sparks's *American Biography* (1851), and A. P. Paton (1863).

Wilson, ANDREW (1831-81), Scottish traveller. Going to India, he edited the *Bombay Times*, and made a journey of exploration in Baluchistan. After that he went to China as editor of the *China Mail*, and travelled extensively there and in Tibet, of which he published an account, *The Abode of Snow* (1875). He was a friend and admirer of General Gordon, of whose Chinese campaigns he wrote a history in *The Ever Victorious Army* (1868).

Wilson, SIR ARTHUR KNYVET (1842), British admiral. En-

tered royal navy, and served in the Crimean war, 1854; Chinese war, 1865; Egyptian campaign, 1882; Sudan campaign, 1884. Was promoted rear-admiral, 1895; vice-admiral, 1901; a lord commissioner of the Admiralty and comptroller of the navy, 1897-1901; commander of the Channel Squadron, 1901-3; commander-in-chief of Home and Channel Fleets, 1903-7; admiral of the Fleet, 1907; and first sea lord of the Admiralty, in succession to Lord Fisher, 1909. He retired at the end of 1911. Sir Arthur was created G.C.V.O. in 1905 and a K.C.B. in 1902.

Wilson, SIR CHARLES RIVERS (1831), president since 1895 of the Grand Trunk Ry., Canada; became a clerk in the Treasury (1856), and after acting as private secretary to Disraeli and Lowe, became secretary to the Royal Commission on International Coinage (1868). He was comptroller-general of the National Debt Office (1874-94), and finance minister in Egypt (1878-9).

Wilson, SIR CHARLES WILLIAM (1836-1905), British general, was born at Liverpool; became secretary to the boundary commission between Canada and the United States (1858-62), and did excellent work for the Palestine Exploration Fund (1864-6). He acted as head of the Intelligence Department in the Sudan (1884-5), and made a desperate effort to reach Khartum. He also served on the Ordnance Survey of Scotland and Ireland (1876-86), and was director-general of the Ordnance Survey of England (1886-94). Among his works are *Notes on the Ordnance Survey of Palestine* (1865) and *Sinai* (1869), *Picturesque Palestine* (1880), *From Korti to Khartum* (1885), *Life of Lord Clive* (1890), and *Murray's Handbooks to Constantinople* (new ed. 1900) and *Asia Minor* (1895).

See *Life* by Sir C. M. Watson (1909).

Wilson, SIR DANIEL (1816-92), Scottish archaeologist and educationist, was born in Edinburgh, and adopted a literary career in London (1837), whence he returned to Edinburgh (1842), and published there his *Memorials of Edinburgh in the Olden Time* (1847; new ed. 1892), and *Prehistoric Annals of Scotland* (1851; 2nd ed. 1863). In 1853 he was appointed professor of history and English literature in Toronto University, becoming president of the institution in 1881, and was knighted (1888). In Canada he issued *Prehistoric Man* (1862; 2nd ed. 1876), *The Right Hand Left-handedness* (1891), and *Anthropology* (1885).

Wilson, GEORGE (1818-59), Scottish chemist and author, was born in Edinburgh, brother of Sir Daniel Wilson. He was in 1840 licensed as the first extra-mural lecturer in chemistry, and in 1855 became curator of the Industrial Museum, and professor of technology in Edinburgh. His *Researches on Colour Blindness* (1855) and his *Life of Cavendish* (1851) are notable. He issued also *Religio Chemicæ* (1862) and *Counsels of an Invalid* (1862), essays of a religious character. See *Memoir* by his sister (1862).

Wilson, HENRY (1812-73), American statesman, born at Farmington, New Hampshire. His real name was Jeremiah Jones Colbaith, but in 1833 he got it changed to Henry Wilson. He was returned to the state legislature first as a Whig, but in 1855 he was sent to the Senate by the Democrats and Free Soil party, and retained his seat there till his death. During the civil war he was chairman of the Military Committee. He was nominated as vice-president of the United States with Grant in 1873, but died a few

months after his election. He was the author of *Anti-Slavery Measures in Congress* (1864), *Military Measures in Congress* (1868), *History of the Rise and Fall of the Slave Power in America* (3 vols. 1872-5). See *Life* by Nason (1872).

Wilson, HORACE HAYMAN (1786-1860), English Orientalist, was born in London, and on his arrival in India (1808) was appointed assistant at the Mint, where in 1816 he became master. He published his first Sanskrit work in 1813, followed in 1819 by his *Sanskrit-English Dictionary*, which remained the standard work till 1875. In 1832 he was appointed Boden professor of Sanskrit at Oxford, and in 1836 librarian to the East India Company. Among his other works are *Account of the Religious Sects of the Hindus* (1828-32), *Select Specimens of the Theatre of the Hindus* (1827), and *History of British India from 1805 to 1835* (1844-8). His *Collected Works* appeared in 13 vols., in 1861-7.

Wilson, JAMES (1805-60), Scottish economist and politician, was born at Hawick. He settled in London as a hat manufacturer, and retired in 1844. Three works brought him reputation—one on the *Corn Laws* (1839), one on the *Currency* (1840), and one on the *Reform of Taxation* (1841); and when in 1843 he founded the *Economist*, he became a recognized power. In 1847 he entered Parliament as member for Westbury, and was a member of the Russell, Aberdeen, and Palmerston administrations, till in 1859 he went to India as financial member of the council. In this capacity he laid the foundation of the present Indian revenue system.

Wilson, JOHN (1785-1854), known as 'Christopher North', Scottish author, was born at Paisley. His poem on the *Study*

of *Greek and Roman Architecture* won the Newdigate prize at Oxford in 1806. Having succeeded to a fortune of £50,000, he settled at Elleray on Lake Windermere, Westmorland, attracted thither by admiration for Wordsworth. In 1817 he became associated with *Blackwood's Magazine*, which owed its brilliant success very largely to him and his friend Lockhart. In 1820 he was appointed professor of moral philosophy in Edinburgh University. In 1851 he retired. Wilson published in 1812 his exuberant poem, *The Isle of Palms*, following it in 1816 with the vivid and occasionally powerful *City of the Plague*. His highest poetical reach is in *Unimore: a Dream of the Highlands*. His *Collected Works* were edited by Ferrier, in 12 vols. (1855-8). Two of the volumes constitute an attractive miscellany of descriptive essays and literary criticism under the general title *Recreations of Christopher North*. Under this pseudonym Wilson figured as the irresistible protagonist and 'Old Man Eloquent' of *Blackwood*. The *Noctes Ambrosianæ*, in four volumes, are ostensible records of symposia at Ambrose's Tavern, Edinburgh, at which North gathers around him such satellites as the glorified 'Ettrick Shepherd,' 'Timothy Tickler' (Wilson's uncle, Robert Sym), the 'English Opium-eater' (De Quincey), and others. The dialogues display high spirits and reckless humour, hearty criticism of current literature and politics, and felicitous descriptive passages in the Scottish tongue. Sir John Skelton's *Selections* (1876) only imperfectly represent these remarkable feasts. A second abridgment of the work by Joanna Scott Moncrieff appeared in 1904. Four volumes of *Essays* include some fine descriptive writing, as in the article on 'Streams; a

valuable disquisition on Burns—one of the best estimates ever given of the poet; and a charming survey and exposition on 'Homer and his Translators.' Some of Wilson's short tales in *The Lights and Shadows of Scottish Life* (1822) are deep and true, but in these and in *The Trials of Margaret Lindsay* (1823), and *The Foresters* (1825), the sentiment tends to be overdone. Mrs. Gordon, Wilson's daughter, published *Christopher North: a Memoir of John Wilson* (1862).

Wilson, JOHN (1804-75), Scottish missionary and Oriental scholar, was born in Berwickshire, and sailed for India as a missionary in 1828. In that capacity he was distinguished by his zeal for female education, and for the study of native languages. He published in 1843 *The Parsi Religion Unfolded*, and in 1858 *India Three Thousand Years Ago*. See *Life* by George Smith (1878).

Wilson, JOHN MACKAY (1804-35), author of the *Tales of the Borders*, was born at Berwick-on-Tweed, and became a popular lecturer on literature, and finally editor of the *Berwick Advertiser* (1832). The *Tales of the Borders*, begun in 1834, won him instant popularity. He issued in all forty-eight numbers, the series being continued after his death by his brother.

Wilson, RICHARD (1714-82), English landscape painter, born at Penegoes, Montgomeryshire. Until his thirty-sixth year he supported himself by portraiture; but going (1749) to Rome, he accidentally discovered his real vocation to be landscape-painting. After his return to England, in 1757, he enjoyed some success, and was one of the original members of the Academy at its foundation in 1768. The National Gallery contains his *Niobe*, the best known of his works; *Mæcenæ's*

Villa; The River Wye; and Lake Avernus, a picture which influenced Turner. See *Some Account of the Life of Richard Wilson*, by T. Wright (1824); and *Memoirs*, by Hastings (1825).

Wilson, Sir Robert Thomas (1777-1849), British general, was born in London. He saw service in the Low Countries in 1794, and was through the rebellion in Ireland (1798). After more fighting in the Low Countries, he joined the forces in Egypt under Abercromby, and was present at the battle of Alexandria (1801). In 1806 he was present at the capture of the Cape of Good Hope from the Dutch. In 1812 he accompanied the Russian army as British commissioner. In 1813 he was attached in a similar capacity to the army of Austria. In 1818 he entered Parliament, and there in 1822 vindicated his partisanship for Queen Caroline, for which he had been dismissed from the army in 1821. He was reinstated on the accession of William IV. See his *Private Diary* (1861), and *Life* by H. Randolph (1863).

Wilson, Thomas (? 1525-81), English statesman and scholar, was born in Lincolnshire, and at Cambridge came under the influence of the new learning, as represented by Cheke, Smith, and Ascham. He published (1552) a treatise on logic, *The Rule of Reason*, and (1553) *The Arte of Rhetorique*. He attached himself to the fortunes of the Dudleys, and endured exile with them; and at Rome (1557) he suffered imprisonment as a heretic. In 1560 he returned to England, and found employment as diplomatic agent to Portugal (1567), and in the Netherlands (1574-7), and in 1579 became secretary of state. He translated Demosthenes, and wrote a *Discourse on the Kingdom's Perils* (1578) and a *Discourse upon Usurpe* (1572).

Wilson, Thomas (1663-1755), English prelate, was born in Cheshire, and became chaplain to the Earl of Derby, from whom in 1697 he received the bishopric of Sodor and Man, and built new churches, established parochial libraries, and translated works of devotion into Manx—his Manx Catechism (*i.e. Principles and Duties of Christianity*, 1707) being the first book published in that language. He also wrote *Short and Plain Instructions for . . . the Lord's Supper* (1736). His *Works* were edited by Keble in 7 vols. (1847-63), with Life.

Wilson, Sir William James Erasmus (1809-84), English surgeon, was born in London; appointed assistant to the Quains at University College, London (1831). About 1840 he devoted himself more especially to the treatment of skin diseases, and in 1869 founded a chair of dermatology in the Royal College of Surgeons, of which he was the first occupant. In 1881 he was knighted. To his teaching is largely due the popularity of the Turkish bath. He defrayed the expense of bringing the Cleopatra's Needle from Alexandria to London.

Wilson Steamship Line, established in 1834 by the late Thomas Wilson, and converted into a private company in 1891. It has a fleet of seventy-four steamers, aggregating 178,400 tons, running between Hull and ports in Norway, Sweden, Denmark, Germany, France, and Russia, the Baltic, Mediterranean, Adriatic, and Black Seas, Bombay, Karachi, Boston, and New York. Five new steamers of 9,367 tons each are being built for the line.

Wilton, a s. suburb of Innsbruck.

Wilton, munic. bor. and mrkt. tn., Wiltshire, England, 3 m. W.N.W. of Salisbury; is the place where carpets were first manufactured in England. It

was the capital of Wessex, and the seat of a bishopric till 1050. It gave name to the county. Sir Philip Sidney wrote part of his *Arcadia* in Wilton House, the seat of the Earls of Pembroke. Pop. (1911) 2,124.

Wiltshire, inland co., S.W. England; hilly throughout the greater part. Towards the s. is Salisbury Plain (20 m. by 16 m.), alt. about 400 ft., bordered on N. by the North Downs. North-east are the Marlborough Downs. Inkpen Beacon, on the borders of Wiltshire, Berkshire, and Hampshire, attains a height of 1,010 ft. The principal rivers are the Bristol Avon and the Salisbury Avon. Canals are the Thames and Severn, Wilts and Berks, in the N., and Kennet and Avon canal in the centre. Dairy-farming is important. Manufactures include broad-cloths (Trowbridge), carpets (Wilton), and railway and locomotive works (Swindon). The county returns five members to Parliament. Wiltshire is noted for antiquarian remains—the Druidic circles of Stonehenge and Avebury; earthworks (Wansdyke); ancient camps and barrows; monastic remains (Malmesbury, Laycock); castles (Devizes, Old Sarum). A large tract of Salisbury Plain has been acquired by government for military purposes. Area, 1,264 sq. m. Pop. (1911) 279,391. See A. G. Bradley's *Round about Wiltshire* (1907), and the *Victoria County History—Wiltshire*.

Wimbledon, munic. bor. (1905) and residential dist., Surrey, England, 7 m. s.w. of London. Wimbledon Common (about 1,000 ac.) was from 1860 to 1889 the meeting-place of the annual competitions of the National Rifle Association, now transferred to Bisley. An ancient earthwork is traditionally ascribed to Cæsar. Pop. (1911) 54,876.

Wimborne Minster, mrkt. tn., Dorset, 6 m. N. of Poole. The minster (12th to 15th century) contains a 14th-century orrery clock, and library with chained books. Pop. (1911) 3,711.

Wimshurst, JAMES (1832-1903), inventor of an 'influence,' or electrostatic machine, was born in London, and acted for some years as surveyor for Lloyds, and afterwards, till 1899, for the Board of Trade. He demonstrated the possibility of dispersing and reflecting the Röntgen rays.

Wimshurst Machine. See ELECTROSTATIC MACHINES.

Winburg, tn., Orange Free State prov., S. Africa, 91 m. by rail N.E. of Bloemfontein. Pop. 2,500.

Winchcomb, par. and mrkt. tn., Gloucestershire, England, 13 m. N.E. of Gloucester. There are flour and silk mills, tanneries, and paper works. Pop. 2,800.

Winchelsea, tn. and Cinque port, Sussex, England, 8 m. N.E. of Hastings. Old Winchelsea, an important seaport in Saxon times, was submerged in the 13th century. Pop. 700.

Winchendon, tn., Massachusetts, U.S.A., in Worcester co., 15 m. N.W. of Fitchburg; manufactures furniture and cotton fabrics. Pop. (1901) 5,678.

Winchester, munic. and parl. bor. and city, Hants, 12 m. N.E. of Southampton, on the Itchen. It is a place of great antiquity, the Caer Gwent of the Britons and the Venta Belgarum of the Romans. A residence of the Saxon kings from the time of Kinegils, it became the capital of the country, a distinction which it long enjoyed. A castle, built soon after the conquest, was later enlarged, especially in the reign of Henry III., whose birthplace it was; and from this period dates the present style of the great hall, the

only portion remaining, now used as the county hall, and containing 'King Arthur's round table.' The city was formerly surrounded by walls, of which two gateways remain—King's gate and West gate. The chief object of interest is the cathedral, dedicated originally to St. Swithun, and founded by Bishop Walkelin in the 11th century, the transepts, crypt, and part of the nave being of that date. It is the largest cathedral in England (557 ft. in length), and has a magnificent interior of various periods of architecture. In 1905 serious defects in the foundations were discovered, and extensive restoration works have been undertaken. Among many ancient monuments and memorials of Saxon and Danish kings and Norman princes are those of Hardicanute and William Rufus. Winchester College, founded in 1387 by William of Wykeham, comprises extensive buildings. Pop. (1911) 23,380. See Kitchin's *Winchester* (Historic Towns Series, 1891), Portal's *The Great Hall, Winchester Castle* (1899), and Milner's *History of Winchester*.

Winchester. (1.) Town, Massachusetts, U.S.A., in Middlesex co., 8 m. N.N.W. of Boston. It is a residential city, and manufactures leather, machinery, and felt. Pop. (1910) 9,309. (2.) Town, Connecticut, U.S.A., Litchfield co., 25 m. W.N.W. of Hartford. Pop. (1910) 8,679. (3.) Town, Kentucky, U.S.A., co. seat of Clark co., 17 m. E. by S. of Lexington. Pop. (1910) 7,156. (4.) City, Virginia, U.S.A., in the Shenandoah valley, 65 m. W.N.W. of Washington. Here, in September 1864, the Northern forces under Sheridan defeated the Confederates under Early. Pop. (1910) 5,864.

Winchilsea, ANNE, COUNTESS OF (d. 1720), English poetess, wife of Heneage Finch, fourth Earl of Winchilsea, was the

friend of Pope and other men of letters, and contributed *Spleen*, her chief poem, to Gildon's *New Miscellany of Original Poems* (1701). *The Prodigy*, a poem which appeared in 1706, drew warm commendation from Cibber. *Miscellany Poems, written by a Lady*, appeared in 1713. Among her poetical experiments is a tragedy entitled *Aristomenes, or the Royal Shepherd*.

Winckelmann, JOHANN JOACHIM (1717–68), German art critic, was born at Stendal in Prussia. He was appointed librarian to Count von Bünaü in 1748. This brought him into touch with the art galleries of Dresden, which inspired him to write his first work, *Gedanken über die Nachahmung der griechischen Werke in der Malerei und Bildhauerkunst* (1754). In the following year his long-cherished desire to visit Italy was fulfilled, after his conversion to Roman Catholicism; and in 1760 he was appointed librarian to Cardinal Albani in Rome. Here he published *Anmerkungen über die Baukunst der Alten* (1762). This was only a prelude to his epoch-making work, *Geschichte der Kunst des Altertums* (1764). This book first revealed the great ideal character of Greek art, and exercised enormous influence on Goethe, Lessing, Wieland, and Schiller. Of equal importance for the history of art was his *Monumenti Antichi Inediti* (1767–8). Accuracy of detail, enthusiasm and insight, a graceful prose style, and, above all, the power of inspiring others, are Winckelmann's great merits. He was assassinated at Trieste when returning to Italy with some gold coins in his possession. His *Gesammelte Schriften* were published in 12 vols. (1825–9). His *Gedanken* were translated by H. Fuseli (1765), and his *Geschichte* by G. H. Ledge (1881, 2 vols.). An excellent bio-

raphy is by K. Justi (1866 and 1872, 2 vols.). See further Goethe's *Winckelmann und sein Jahrhundert* (1805), A. Baier's *Winckelmanns Lehre vom Schönen* (1862), and Walter Pater's *Renaissance* (1873).

Wind is air in motion, and is directly produced by differences of pressure, there being a flow of the air from a region of higher to one of lower pressure, or from where there is a surplus to where there is a deficiency of air. Differences of atmospheric pressure arise from changes produced in the main by differences of temperature, which are, therefore, the ultimate cause of wind. The force and direction of the wind are registered automatically by means of an anemometer. The Beaufort scale is a notation whereby the relation between the force of the wind and the amount of sail that a ship could carry is given effect to. It was devised in 1805 by Sir F. Beaufort. In its modified form it is as follows:—

Force.	Description.	Velocity: Miles per hour.
0	Calm	3
1	Light air	8
2	Light breeze	13
3	Gentle	18
4	Moderate	23
5	Fresh	28
6	Strong	34
7	Moderate gale	40
8	Fresh	48
9	Strong	56
10	Whole	65
11	Storm	75
12	Hurricane	90

In anticyclones, or areas of high pressure, the wind blows outwards towards places where lower pressures prevail. Round these low-pressure areas the wind blows spirally inwards towards where the barometer is lowest. Owing to the deflecting force exerted by the rotation of the globe on its

axis, the winds are turned to the right hand in the northern and to the left hand in the southern hemisphere. This force is inversely proportionate to the velocity of the earth's rotation, and increases from zero at the equator to a maximum at either pole. The strength of the wind is greatest in both hemispheres during the winter months. Winds have been classified into constant, periodical, and prevailing; but the whole problem of wind discussion is far from being completed. Much additional knowledge of the general character of the atmospheric circulation has been obtained recently by observation of cloud movements and balloon and kite ascents. In the tropical zone, above the calm region near the surface blows a steady wind from the east at the rate of 80 miles an hour. North and south of the tropics are the trade-wind zones, where the surface winds blow from the north-east and south-east respectively, compensated by anti-trades in the upper atmosphere blowing from the south-west and north-west. In the northern hemisphere a layer of wind from the north-west is usually found between the surface and upper winds. In the temperate zones the air is involved in vast 'polar whirlpools,' which rotate from west to east, the movement, apparently similar to that of an ordinary cyclone, being spirally inwards near the surface and outwards in the higher regions. There appears to be no direct circulation between the poles and tropics. See *Quarterly Journal Royal Met. Soc.* (Oct. 1904), Coffin's *The Winds of the Globe* (1876), Buchan's *Report on Atmospheric Circulation* (1889), Ferrel's *A Popular Treatise on the Winds* (1893), Pomortzoff's *The Law of Distribution of the Velocity of Winds* (1894), *The*

Beaufort Scale of Wind-Force (1906), Bartholomew's *Atlas of Meteorology and Physical Atlas* (vol. iii. 1899). See also **BUYS-BALLOT'S LAW** and **FERREL'S LAW**.

Windau, seapt. and seaside resort, Kurland gov., Russia, on l.bk. of Windau, 110 m. W.N.W. of Riga; has sawmills. Exports (1910), £7,434,904 (chiefly butter, cereals, flax, hemp, tow, and timber); imports, £1,498,680 (machinery, cotton, indiarubber, etc.). A great influx of trade has come to Windau since the construction of the railway connecting it with the interior of the empire. Pop. 15,000.

Windber, bor., Somerset co., Pennsylvania, U.S.A., 22 m. N.E. of Somerset; has coal-mining. Pop. (1910) 8,013.

Windermere. (1.) Lake, Westmorland and Lancashire, and the largest in England, stretching 10½ m. N. and S.; greatest breadth, 1,610 yds. The shores are much indented and generally low, but steeper and more rugged in the S. In the centre are several wooded islets. It is drained by the Leven to Morecambe Bay. Alt. 130 ft.; maximum depth, 219 ft. Area, over 5½ sq. m. See H. R. Mill's *Bathymetrical Survey of the English Lakes* (1895). (2.) Par. and tn., Westmorland, England, on the E. shore of Lake Windermere, 7 m. N.W. of Kendal. The town is the terminus of a branch of the L. & N.W.R. Pop. urb. dist. (1911) 5,147.

Windfalls, in law, are timber trees (not fruit trees) blown down by the wind. Sound trees so blown down belong to the landlord, while dotards, or dead timber, belong to the tenant. If windfalls remain attached to the soil they are real property, otherwise they are personal property.

Wind-flower. See **ANEMONE**.

Windham, tn., Windham co., Connecticut, U.S.A., 15 m. N. of Norwich. Pop. (1910) 12,604.

Windham, WILLIAM (1750-1810), English statesman, was born in London. In 1784 he entered Parliament as member for Norwich, and acted with the opposition. He was one of those charged with the impeachment of Warren Hastings. He was largely guided by Burke, and took alarm at the French revolution. In 1794 he took office under Pitt, and eventually became the secretary of war, holding office till 1801. In opposition to the Addington ministry he disapproved of the peace of 1802, and refused to join Pitt's administration in 1802; but later he joined Lord Grenville's administration, and with it resigned in 1807. See his *Diary*, ed. by Mrs. H. Baring (1866); and *Life*, by Amyot (1806).

Windhoek, GREAT, tn., cap. of German S.W. Africa, on the Swakop R., 170 m. inland from Walvis Bay. It possesses hot springs. Vines, peaches, oranges, figs, dates, and pomegranates thrive. Pop. (1910) 2,129.

Winding-up. See **BUILDING SOCIETY**, and **COMPANY**.

Wind Instruments are generally understood to include only those musical instruments which are sounded by the breath or by the combined action of the breath and lips of the performer. Orchestral wind instruments are of two classes: viz. wood winds—flutes, clarinets, oboes, and bassoons; and brass winds—horns, trumpets, and trombones.

Windischgrätz, PRINCE ALFRED ZU (1787-1862), Austrian field-marshal, born at Brussels; served in the campaign of 1814, and became field-marshal (1833). He defeated the insurgents in the revolution of 1848, taking Vienna by storm. He then led a large army into Hungary, but was removed from command owing to

his dilatory conduct. See *Der k. k. österreichische Feldmarschall Fürst Windischgrätz* (1885).

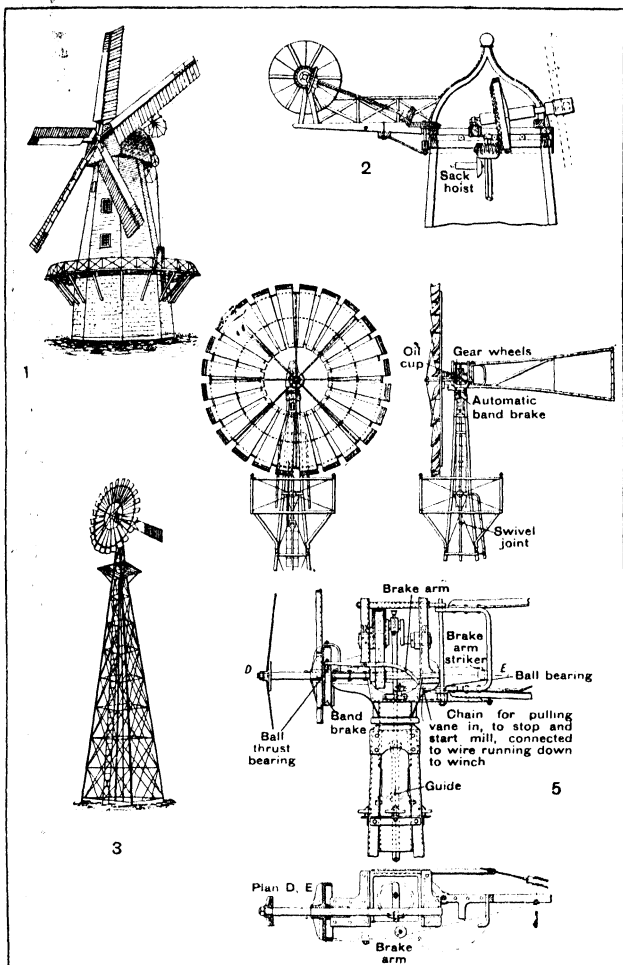
Windlesham, urb. dist., Surrey, England, 8 m. w.s.w. of Chertsey. Pop. (1911) 4,249.

Windmills are believed to have been first introduced into Europe in the 8th or 9th century. Figs. 1 and 2 are taken from *Traction and Transmission*, vol. vii. The principle of action in the windmill is very similar to that in the water turbine. The wind acts upon four or more sails or sweeps radiating from a shaft and set at an angle with the wind's direction. The plane in which the sails rotate is practically at right angles to the direction in which the wind is blowing. As the direction of the wind is somewhat variable, provision is made for bringing the sails to face the wind. This necessity originally led to windmills being divided into the two following types:—The Post or German type, in which the whole body of the mill was supported upon a vertical post or pivot, upon which it could be revolved; and the Tower or Dutch mill, in which only the head, or dome, of the building was movable—the lower part, or tower, being built of stone, brick, or timber. The dome was rotated through a toothed wheel, which geared with a circular rack on the outside of the upper part of the tower, and the turning was effected by manual labour in the older mills, and automatically in the more modern mills, which were provided with an auxiliary windmill or 'fan-tail,' the invention of Andrew Meikle. This consisted of a set of small sails placed in an upright position upon a long arm or frame projecting beyond the dome on the opposite side to the main sails, and revolving in a plane almost at right angles to the plane of revolution of the sails of the

windmill proper. (Fig. 1.) The axis of the wind shaft is usually inclined at an angle of from 8° to 15° with the horizontal, so that the main sails may clear the lower part of the tower, and in addition be in a more advantageous position to receive the impulse of the wind. A section through the dome of a tower mill is given in Fig. 2, which shows the method of rotating the dome by means of the fan-tail, also the gearing connecting the wind shaft with the main vertical shaft. The length of each sail or sweep in an old type windmill was usually from 20 ft. to 40 ft. The angle which the surface of the sail makes with its plane of revolution is called its 'weather.' The weather of the sail usually varies from 7° at the extremity to 18° at the end nearest the wind-shaft.

Provision is made for adjusting the amount of sail area to the strength of the wind, generally by 'reefing' the sails. Another method was to make the sails of a series of flaps, shutters, or louvers, made of light deal, or of canvas stretched on wooden frames. Each shutter was pivoted so as to admit of being rotated about an axis at right angles to the whip.

During the past few years there has been a great development in the manufacture of small power wind-pumping engines, especially in America. Instead of four to six sails of large width, as in the old type of windmills, there are a considerable number of thin sheet-steel sails or blades arranged radially round a shaft, and forming a wheel. Control is effected by mounting the wheel on a revolving head and providing a rudder or tail-vane, which, with any change of the wind, will allow the wheel to run into the wind, or in the case of excessive velocity throw the wheel more or less out of the wind. The sails



Structure of Windmills.
(For explanation, see text.)

are usually slightly concave on the windward side, and are set at an angle such that their tips move about 2.5 times the velocity of the wind. The wind shaft may be horizontal or inclined, and generally runs in roller or ball bearings. The pump is driven either direct off the wheel shaft or through suitable bearing. The wheel is mounted on the top of a tower usually built of steel angles suitably braced. Fig. 3 is an illustration of a typical wind-pumping engine, erected on a steel tower; Fig. 4 is a front and side elevation of the wheel, tail-vane, etc.; and Fig. 5 is an elevation and plan of the head gearing. In the particular windmill here illustrated the wheel is 16 ft. in diameter, with twenty-four blades, each blade being 5 ft. 3 in. long, tapering from 20 in. to 8 in., and curved to a radius of 20 in. The wheel spindle drives the pump crank shaft through 2½ to 1 in. spur gearing. On the boss of the wheel there is a steel band brake (see Fig. 5), operated by an arm pressed by a pin or striker fixed on the arm of the tail-vane. It automatically comes into action when the mill is at work in gusty weather, and also when the wheel is pulled out of action by a windlass fitted at the base of the tower. The wheel-shaft is set a little to one side of the centre (see front elevation Fig. 4, and plan Fig. 5), and the tail-vane directly in the centre: thus, when working in strong winds, the wheel is inclined to turn out of the wind, but is controlled by coiled springs connecting the tail-vane with the head of the machine, which keeps the machine sufficiently in the wind to allow of its working at a proper speed for pumping. The revolving head is supported on ball bearings at the cap of the tower; any lateral pressure is taken up

by a steel tube which descends through the tower head, and is guided by four rollers. See Wolff's *The Windmill as a Prime Mover* (new ed. 1900).

Window-gardening, the growing of plants in pots within the window of a room, or in pots or boxes on the window-sill outside. The plants that may be satisfactorily grown in windows include zonal pelargoniums, scented-leaved geraniums, dwarf campanulas, primulas of all sorts, aubrietia, wallflowers, anemones, narcissi, tulips, irises, forget-me-nots, daisies, petunias, musk, and asters. Then there are fragrant herbs such as southernwood and thyme, and herbs and salad plants such as parsley and cress. Ferns, too, of many kinds do well in pots or window-boxes. Agaves, gasterias, sempervivums, echeverias, cchinocactus, and mammillarias are especially suitable for indoor decoration all the year round. *Isolepis gracilis* and the blue-leaved *Festuca glauca* are both worth growing in the window during winter.

Windows. The earliest example of windows playing any important part in architectural construction are the clerestory lights in the great temples and palaces of Egypt, as at Karnak and Thebes, and in the Assyrian and Persian palaces, where large roof windows were formed with timber not unlike modern deck lights, as at Korsabad and Persepolis; these, of course, were open to the elements. Much discussion has taken place on the question of the lighting of Grecian and Roman temples. Ferguson ingeniously fits in clerestory windows after the Egyptian method to several Greek temples in a more or less conjectural manner. There is little doubt, however, that some of these temples had openings in the roof, while it is suggested that some were lighted by openings in

the ceiling only, the roof above being of thin marble slabs which allowed a diffused light to penetrate the *cella*. The Erechtheum on the Acropolis has windows in the west wall, and the great temple at Agrigentum in Sicily had windows in the walls of the side aisles. In Roman houses the *atrium*, or principal hall, was open to the roof, while the rooms entering off the same were lighted only by the doors. Later they had windows protected by shutters, and a transparent material, probably mica, was used for glazing, till in the 2nd century horn came into general use. In the middle ages cloth seems to have been used, as with the Chinese today.

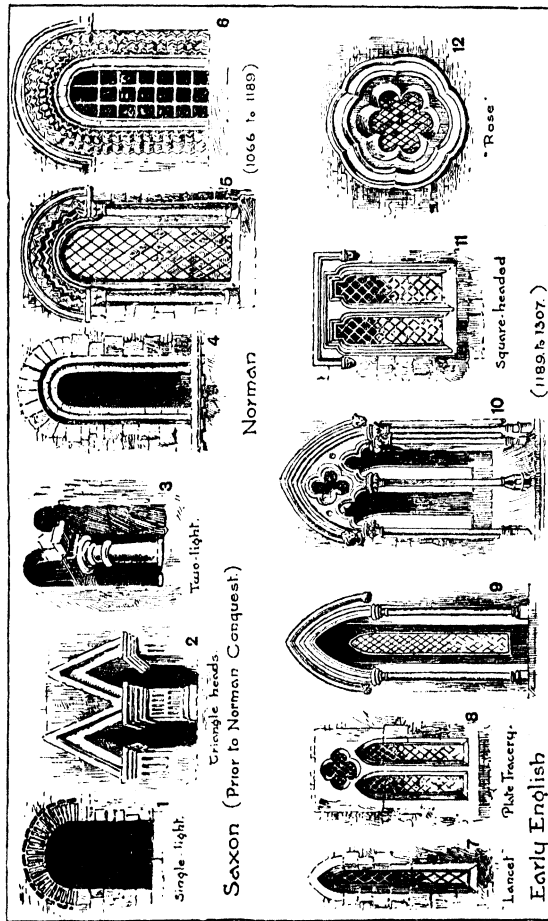
The first use of glass in windows is variously stated; but there is no doubt that the introduction of stained glass into church windows gave a new and overpowering impetus to Gothic architecture, and eventually made the whole idea of construction subservient to its display. Windows are sometimes built up as separate architectural features in the roof. These are called dormer windows, from the fact that dormitories in old monasteries were often in the roof. Such windows are common in French Renaissance buildings. When a window projects from the face of the wall and is supported on corbels, it is called an oriel window; these were common in English houses of the 15th century. Lattice windows are frames divided into small panes with astragals or lozenges; French or casement windows open like doors; while modern windows are called sash-and-case windows—the sash being the frame for the glass, and the case being the fixed frame cased for the counterbalance weights.

Windpipe. See TRACHEA.

Wind River, range of mountains in W. Wyoming, U.S.A., a

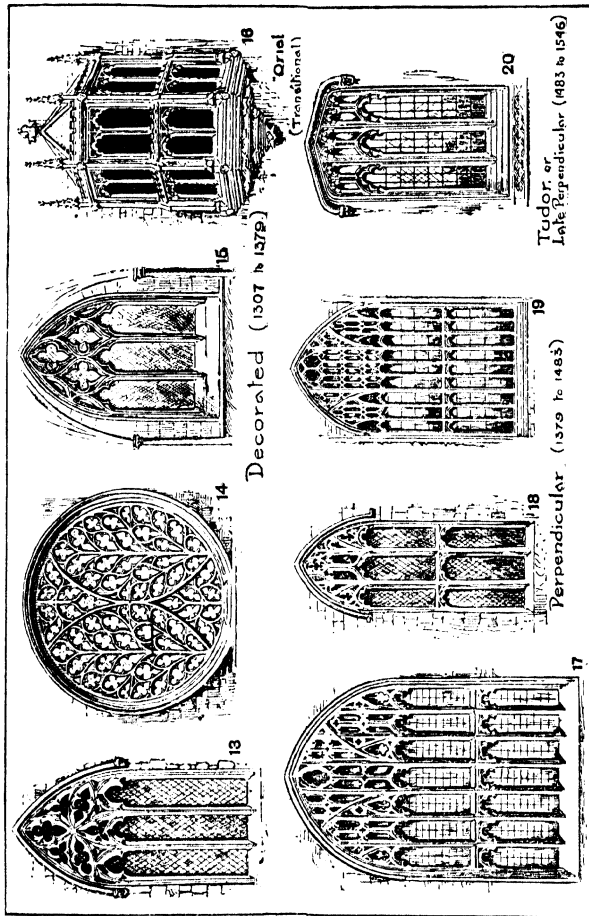
part of the Rocky Mountain system, separating the sources of Green and Snake Rs. from those of Wind R., which is tributary to the Yellowstone. Many of the peaks exceed 13,000 ft. in height, and are extremely rugged, having been extensively glaciated in recent times. Among these are Mt. Chauvenet (13,000 ft.) and Fremont Peak (13,790 ft.).

Windsor. (1.) Parliamentary and munic. bor. and mrkt. tn., Berkshire, England, on the Thames, 20 m. w. of London. The present town replaced an older one, now represented by the village of Old Windsor, about 2 m. to the E., where was a royal residence granted with the town by Edward the Confessor to the monks of Westminster. William the Conqueror regained possession of it, and occasionally resided there. He built a fortress on the hill now occupied by the castle, and around this grew up the new town. The parish church, a handsome edifice, replacing one pulled down in 1820, contains many ancient monuments; and there is a spacious military church (Holy Trinity), of which the foundation stone was laid by Prince Albert in 1842. Other public buildings are the Guildhall and the Masonic Hall, both designed by Sir Christopher Wren; the Albert Institute, and a statue of Queen Victoria. There are also military barracks. Here was the famous 'Garter' Inn, a resort of Sir John Falstaff in *The Merry Wives of Windsor*. A bridge 200 ft. long connects the town with Eton, and two other bridges cross the river to Datchet. At Clewer, 1 m. to the W., is a large group of charitable institutions (penitentiary, hospital, orphanage, convalescent home), under the care of an Anglican sisterhood. Windsor returns one member to the House of Commons. Pop. (1911) 12,681. (2.) Town,



Types of Windows.—I.

Anglo-Saxon.—1. Brixworth, Northants. 2. Deerhurst, Gloucester. 3. Wrexham, Denbigh. **Norman.**—4. Cassington, Oxon. 5. Devises, Wilts. (c. 1160). 6. Ilfley, Oxon. **Gothic.**—7. Burwash, Sussex. 8. Lillington, Warwickshire. 9. Bakewell, Derbyshire. 10. Stone, Kent. 11. Glapthorne, Northants. 12. Strixton, Northants (c. 1250).



Types of Windows.—II.

13. Eling, Hants (c. 1320). 14. Lincoln Cathedral (c. 1350). 15. Wells Cathedral. 16. Thornton Abbey, Lincolnshire (c. 1370).
 17. St. Mary's, Oxford. 18. Headcorn, Kent. 19. Norwich Cathedral. 20. Yelvertoft, Northants.

Essex co., Ontario, Canada, on the Detroit R., immediately opposite the city of Detroit. It is chiefly a residential town, largely for Detroit people. Its manufactures include automobiles, salt, patent medicines, machinery, and furniture. Pop. 17,000. (3.) Seaport and co. tn. of Hampshire, Nova Scotia, on Minas Basin, off the Bay of Fundy; is the seat of King's College (founded 1787), an Anglican institution, and the oldest university of the empire outside the British Isles. The town was visited by a disastrous fire in 1896. Gold, antimony, and manganese occur in the vicinity. Pop. 3,500. (4.) A southern suburb of Melbourne, Australia. Pop. 2,100.

Windsor Castle, the chief royal palace of England, stands on an eminence near the Thames, in the E. of Berkshire. The buildings and immediate grounds cover an area of 12 ac. Henry I. made extensive additions to the fortress constructed by William the Conqueror, and the fortress became a palace. Henry III. strengthened its fortifications. Edward III. was born here, and after his accession he rebuilt and greatly enlarged the palace, erected the keep, the Winchester Tower, Chapel of St. George, and St. George's Hall; and here he held the first installation of knights of the Order of the Garter. Tudor and Stuart sovereigns contributed their quota of additions and improvements, and James II. and William of Orange added fine collections of paintings. During the reigns of George III. and George IV. more than a million pounds of public money was spent on the castle under the direction of Jeffrey Wyatt, afterwards Sir Jeffrey Wyatville. The works included the erection of new towers, handsome entrances, addition of a story to the general elevation, and

the rearrangement of the pleasure grounds and parks. The new stables were built in the early part of Queen Victoria's reign. The castle comprises three principal divisions—the Upper, Middle, and Lower Wards. The first has a large quadrangle, the chief entrance to which, opposite the Long Walk, is flanked by the battlemented towers of York and Lancaster. On the E. side of the quadrangle are the private apartments of the sovereigns, on the S. the Visitors', and on the W. the State Apartments. The last include the Audience, Presence, Grand, and Waterloo Chambers, St. George's Hall, Grand Reception Room, Grand Vestibule, State Anteroom, and the Zuccarelli and Vandyke Rooms, with splendid collections of the works of these painters. A corridor, 520 ft. long and richly decorated, runs along the S. and E. side. On the W. side of the quadrangle is the Round Tower or Keep, forming the Middle Ward. It formerly served as the residence of the constable, and also as a state prison. The lower part is surrounded by a rampart mounted with cannon. West of the Round Tower is the Lower Ward, approached from the town by Henry VIII. gateway, and comprising St. George's Chapel, Albert Chapel, Deanery, and canons' houses, cloisters, Lord Chamberlain's Office, and houses of the military knights. St. George's Chapel, built chiefly by Edward IV., was greatly enriched by Henry VII., and still more by George III. It is a cruciform edifice, with nave of seven bays and eight side chapels and two chantries. In the choir are the stalls of the sovereign and of the Knights Companions of the Order of the Garter, and beneath the choir the royal vault. Opposite the east end of the choir is the royal tomb house, formerly known as

the Wolsey Chapel, but now as the Albert Memorial Chapel, containing a magnificent cenotaph with recumbent figure of the Prince Consort, and the tomb of Edward VII. A terrace, 2,900 ft. in length, surrounds the castle on the N., E., and S. sides; below, on the E., is the sunk garden, opposite the private apartments; and on the N. are the ornamental pleasure-grounds, known as the 'slopes.' The royal stables occupy an outlying block near the Long Walk, and include a riding-school (200 ft. in length). The Home Park, immediately adjacent to the castle on the N.E. and S., has an area of 500 ac. The Great Park, of about 1,800 ac., is traversed for three miles by a magnificent avenue known as the Long Walk, terminated by Snow Hill, an eminence surmounted by a statue of George III., and having by the side of it the royal palace and mausoleum of Frogmore, in the latter of which rest the remains of the Prince Consort and Queen Victoria. Virginia Water, a large ornamental lake, lies in the south of the park.

Windt, HARRY DE. See DE WINDT.

Windthorst, LUDWIG (1812-91), German statesman, born near Osnabrück in Hanover. A devout Roman Catholic, he was appointed president of the Catholic consistorium and one of the judges (1843) of the Hanoverian Supreme Court of Appeal. He then became a representative for his native place in the Hanoverian Second Chamber. Elected president of the Chamber (1851), he became in the same year minister of justice. After the annexation of Hanover by Prussia he became a member both of the Prussian Parliament and of the North German Diet, and ere long was recognized as the leader of the Ultramontane Opposition against

Bismarck. See *Life*, in German, by Manzenbach (1891-2), and by Knopp (1898).

Windward Islands, THE BRITISH, form part of the Lesser Antilles, West Indies, lying to the S. of the Leeward Islands. They include Grenada, St. Vincent, St. Lucia, and the Grenadines. Their total area is about 510 sq. m., and the pop. 180,000. The total imports in 1909 were valued at £613,468, and the exports at £508,464.

Wine, an alcoholic beverage produced by the fermentation of sugars expressed from many sweet fruits, such as grapes, currants, raspberries, elderberries, apples; or from vegetables, as rhubarb and carrots; or even from flowers, as the cowslip. All the more important wines are obtained from grape juice alone. The Jews, Assyrians, Greeks, Egyptians, Romans, all had their favourite wines. Many of the famous modern wines are obtained from vineyards situated on southerly or westerly mountain slopes and river banks. Modes of propagation and special varieties of vines; improvements in the machinery for expressing the juice; treatment of the 'must' or expressed juice during fermentation; types of yeast best adapted for aid in producing the special bouquet and other characteristics; improvements in finishing and maturing, and not the least in combating the ravages of the phylloxera, insect pest, mildews, and other disease-producing micro-organisms both on the plant and the wine—all these matters have been carefully studied.

The ripe fruit contains numerous constituents, all of which vary considerably with the soil, climate, position of the vineyard, and variety of grape. As a general rule, when the grapes are just fully ripe they yield

the best wine as regards strength and flavour. Some varieties require to be gathered just before the fruit is ripe; others, especially the muscatels, when somewhat overripe, in order to give the characteristic bouquet of the wine. Tokay wines are made from grapes which have been partially dried on the vines. Grapes containing much sugar, which may be due to either a variety of vine or to a rather dry warm summer, yield generous alcoholic wines, and these when dry—i.e. when they contain but little unfermented sugar—are often very full-bodied. When deficient in sugar, it may be necessary to add sugar, or concentrate the 'must' by boiling down, or spread the grapes in the sun to dry partially, or some other device must be adopted.

The fermentation of the 'must' is said to be a spontaneous act, but it is due to wine yeasts which exist in the bloom on the berries. During recent years Hansen of Copenhagen, Jacquemin of Paris, and others, have obtained pure cultures from the more important vineyards; consequently each producer is able to use the particular type which gives the chief characteristics of his wine. In rather less than a month the primary fermentation is over, and the turbid liquid has become moderately clear. The new wine is run off from the precipitate of argol and lees into other casks, in which an after-fermentation proceeds for some months. It is finally transferred to the finishing casks, where the fining with isinglass to clarify, sulphuring to prevent corkiness and other diseases due to micro-organisms, colouring and doctoring when necessary, and plastering, are carried out. This last is of some importance, as natural or unfortified wines have a tendency to become turbid with both in-

crease of age and temperature. Gypsum or other form of calcium sulphate is added, which precipitates salts of the various acids out of the wine, and so increases its stability. The residue of wines left in the fermentation vats is known as lees, and is an important source of cream of tartar and ordinary tartaric acid. The residue from the wine press is known as marc, a substance frequently worked up into inferior grades of brandy.

Wines are distinguished by their colour, flavour, bouquet or aroma, taste on the palate, and as still or sparkling. These points of difference depend on the variety of grape vine, the soil and site of the vineyard, the treatment of the fruit at the time of vintage, and the difference in the mode of manufacture and finishing. Thus, if fermentation is stopped before all the sugars have been decomposed, a fruity wine is the result. Dry wines are due to the completion of the fermentation of the sugars. Effervescing or sparkling wines are caused by the presence of carbon dioxide, by bottling the fermenting liquid and allowing the fermentation to finish in the bottle. The chief characteristic of a wine is the quantity of alcohol present. When the whole of the alcohol has been produced by fermentation, and this rarely exceeds 14 or 15 per cent. by volume, the wine is said to be a natural one. All others containing above this limit are spoken of as fortified or brandied wines. Light wines—as burgundy, clarets, hocks—contain from 7 to 12 per cent. of alcohol; while the strong, fortified ones range from 16 to 35 per cent. Unfortunately there is no standard by which the characteristics of a wine—say quality, flavour, bouquet, body—may be judged after it has matured. The after-treatment

affects it enormously — for instance, the length of time required to mature (and this depends partly on the vintage season), the quantity of spirit added, the colouring matters used, the artificial flavouring employed. The natural colours of wines are due to, in the case of red wine, leaving the skins in the vats during primary fermentation. The pale to golden tints are partly caused by oxidation of tannins and similar bodies. 'Must' is a complex mixture of bodies in solution. The bouquet of a wine is due to the ethers, and probably also to the yeast action. The peculiar vinous odour and taste are caused by traces of ænanthic ether, and when the wine is distilled this volatile ester passes over into and characterizes the brandy produced. Fixed esters are predominant in fortified wines, while volatile ones are predominant in natural wines, especially those that are poor in alcohol and sugar.

The more important modern wines are champagne, claret, burgundy, port, sherry, hock, madeira, marsala. Burgundy is a dark-red natural wine, produced in the eastern centre of France, California, and Australia. Champagne is the sparkling product of Champagne, Loire, Marne, and the Jura in France; Australia, New Zealand, and the Cape. Claret is the light-red wine of Médoc and the district around Bordeaux, and Karlowitz in Hungary. Hermitage is a class of wine for which the Rhone valley is famous. Hock and moselle are light sparkling wines, the production of the vineyards bordering on the Rhine, Moselle, and Main. Madeira is a sherry type of fortified wine, containing a high percentage of volatile esters. Marsala is a Sicilian wine, also of the sherry

type. Malaga is a sweet, luscious wine of the south-east of Spain. Port is a strongly-fortified red wine, produced in Portugal, France, north of Spain, the Cape, and Australia. Sauterne is the white wine of the Graves district of France. Sherry is a strongly-fortified golden wine, for which the Heves district of Spain has long been famous. It is also obtained from the Canary Isles and elsewhere. Tokay is the finest of Hungarian wines. See Batillat's *Traité sur les Vins de la France* (1846); Dupré's *Analyse des Matières Alimentaires*; Hutchison's *Food and Dietetics* (1900); Monavon's *La Coloration Artificielle des Vins* (1890); Neubauer's *Ueber die Chemie des Weines* (1870); Pasteur's *Etude sur les Vins* (1866); Schmidt's *Die Weine des Cabinets-keller* (1898); Thudichum's *A Treatise on the Origin, Nature, and Varieties of Wine* (1894).

Winfield, city, Kansas, U.S.A., co. seat of Cowley co., 47 m. s.s.e. of Wichita. Pop. (1910) 6,700.

Winfried. See BONIFACE, ST.

Wing, in engineering, a term signifying a projection: wing walls are the retaining walls at the ends of a bridge.

Wingate, SIR FRANCIS REGINALD (1861), British general, born at Broadfield in Renfrewshire. Practically the whole of his career has been spent in Egypt and the Sudan. He served through the Nile expedition of 1884-5. In the operations on the Sudan frontier in 1889 he was present at Toski. He took part in the further operations in 1891, including the capture of Tokar. He was director of military intelligence with the Dongola expeditionary force in 1896, and was present in the engagements at Firket and Hafir; and, again in the same capacity, in the operations in 1897-8, which resulted in the capture of Abu Hamed

and the subsequent occupation of Berber; and in the final phase of the reconquest of the Sudan in 1898, when he took part in the battles of Atbara and Omdurman (September). Wingate came up with the fugitive Mahdi on November 24, near Gedid, and annihilated his force, the Mahdi himself being among the slain. In December 1899 Sir Francis Wingate became sirdar of the Egyptian army and governor-general of the Sudan. He was in charge of the special mission to Somaliland (1909). He is the author of *Mahdism and the Egyptian Sudan* (1889), and the translator of *Ten Years' Captivity in the Mahdi's Camp* (1891), by Joseph Ohrwalder, and of Slatin Pasha's *Fire and Sword in the Sudan* (1895).

Wings. See BIRDS and FLIGHT.

Winkelried, ARNOLD VON, a knight of the Swiss canton of Unterwalden, one of the heroes in the struggle for Swiss independence. At the decisive battle of Sempach, near Lucerne (1386), the Austrians formed a dense mass of steel, which the utmost efforts of the Swiss failed to penetrate. At last Winkelried rushed forward, grasped as many of the Austrian spears as he could, and bore them to the ground by sheer weight, thus making a path for his comrades over his pierced body.

Winkler, CLEMENS ALEXANDER (1838-1904), German chemist, was born at Freiberg, and became professor of the Mining Academy there in 1873. His chief work consisted in developing the methods of gas analysis, in advancing mineralogical chemistry, and particularly in discovering the element germanium, which proved to be the eka-silicon predicted by Mendeléeff. He wrote *Anleitung zur chemischen Untersuchung der Industriegase* (1876-79) and *Die Massanalyse nach*

neuem titrimetrischen System (1883).

Winnebago, LAKE, Calumet, Fond du Lac and Winnebago cos., Wisconsin, U.S.A. It is 30 m. long, with a maximum breadth of 10 m., and constitutes part of the course of the Fox R.

Winnipeg, city, cap. of prov. Manitoba, and the commercial metropolis of Central Canada, is situated at confluence of Assiniboine and Red Rs., 40 m. s. of Lake Winnipeg, and 1,424 m. by rail w. of Montreal. In 1871 it had a population of 241, and was one of the Hudson's Bay Co.'s trading posts, known as Fort Garry. Since its choice as the capital of Manitoba its growth has been very rapid; and its trade has increased faster even than its population, for the opening of the Canadian Pacific Ry. across the continent made it an important distributing centre. It does a large trade by river as well as by rail. It is now the premier wheat market of North America, having displaced Minneapolis. Eighty-eight million bushels of wheat were marketed there during 1910. Here is the University of Manitoba (about 500 students). Pop. (1881) 6,000, (1906) 90,216, (1911) 135,430.

Winnipeg Lake, in Manitoba and Keewatin, Canada, N. of Winnipeg, covers an area of 8,555 sq. m., with a maximum length N.N.W. to S.S.E. of 250 m. It receives the Winnipeg in the E., the Assiniboine and the Red R. in the S., the Saskatchewan in the W., and is drained by the Nelson into Hudson Bay. It contains numerous islands.

Winnipegosis, LAKE, or LITTLE WINNIPEG, lies about 50 m. w. of Lake Winnipeg. Its length is 125 m. N. and S., with a maximum width of 17 m.

Winona, city, Minnesota, U.S.A., co. seat of Winona co., on the Mississippi, 100 m. S.E. of

St. Paul; has railway shops and large grain and lumber interests. Pop. (1910) 18,583.

Winschoten, comm., Netherlands, prov. of and 20 m. E. by S. of Groningen. Pop. (1910) 11,202.

Winsey, or WINCEY, a mixed textile fabric, plain or twilled, generally with a cotton warp and woollen filling. This fabric is made in Aberdeen, Perth, and other places.

Winsford, urban dist., Cheshire, England, 15 m. E. of Chester. It is an important salt-producing district. Pop. (1911) 10,772.

Winslow, par. and mrkt. tn., Buckinghamshire, England, 6 m. S.E. of Buckingham. It is an agricultural centre. Pop. urban dist. (1911) 6,995.

Winslow, EDWARD (1595-1655), English colonial governor, was born at Droitwich, and having joined the English Puritan exiles at Leyden, in 1620 sailed with them for America. In 1623 he was selected as their agent in England, and while there he published *Good News from New England* (1624). In 1624 he was elected by the colonists assistant governor, to which office, or that of governor, he was annually re-elected till 1646. He returned to England (1646) on a mission to defend the colonists, and was there active in a pamphlet warfare on their behalf. He found employment under the commonwealth, and did not return to the colony, dying on the expedition which resulted in the capture of Jamaica.

Winslow, FORBES BENIGNUS (1810-74), English physician, was born at Pentonville, London. He wrote *Physic and Physicians*, anecdotal (1839); *The Anatomy of Suicide* (1840); *The Plea of Insanity in Criminal Cases* (1843); and *The Incubation of Insanity* (1845). He gradually made a reputation as a specialist on insanity; founded the *Quarterly Journal*

of *Psychological Medicine* (1848); and wrote *On the Obscure Diseases of the Brain and Mind* (1860), and *On Uncontrollable Drunkenness* (1865).

Winslow, JOHN (1702-74), American general, grandson of Edward Winslow, was born at Marshfield, Massachusetts, and was the principal actor in the tragedy of the expulsion of the Acadians from Nova Scotia (1755). He was commander-in-chief at Fort William Henry (1756), and afterwards became a judge in Plymouth county (1762), and member of the Massachusetts Legislature during the Stamp Act difficulties.

Winslow, LITTLETON STEWART FORBES (1844), English physician, founder of the British hospital for mental disorders in London; is a native of London. He is one of the leading specialists in mental diseases, and has given evidence as an expert in many of the principal criminal cases in Britain and America. His works include *Manual of Lunacy* (1874), *Handbook for Attendants on the Insane* (2nd ed. 1882), *Fasting and Feeding Psychologically Considered* (1881), *Aids to Psychological Medicine* (1882), *Youthful Eccentricity a Precursor of Crime* (1895), and *Mad Humanity* (1898). See his *Recollections of Forty Years* (1910).

Winsor, JUSTIN (1831-97), American historian, born in Boston, Massachusetts. In 1868 he was appointed librarian of the Boston public library, and in 1877 received a similar post at Harvard University, which he held until his death. He wrote *Christopher Columbus* (1891), *Cartier to Frontenac* (1894), *The Mississippi Basin* (1895), *The Westward Movement* (1897), *Was Shakespeare Shapleigh?* (1887), *Reader's Handbook of the American Revolution* (1879); and he edited *Memorial History of Boston* (4 vols. 1880-1), and

Narrative and Critical History of America (8 vols. 1884-9).

Winstanley, HENRY (d. 1703), English engineer and engraver, was born probably at Saffron Walden, and became a clerk of works on Charles II.'s estates. In 1696 he was asked to make designs for a lighthouse on the Eddystone Rock, and they were adopted. He superintended the construction, and was carried off a prisoner by a French privateer (1697). On regaining his liberty he returned to his labours, and the edifice was completed (1700). Winstanley was swept away with the entire structure, which was largely built of wood, in a great storm in 1703.

Winsted, tn., Connecticut, U.S.A., 25 m. N.W. by w. of Hartford; manufactures clocks, silk and knitted goods, cutlery, hardware, etc. Pop. (1910) 7,754.

Winston, city, N. Carolina, U.S.A., co. seat of Forsyth co., 60 m. w. of Raleigh. Tobacco and cotton are the principal manufactures. Winston and Salem (pop. 5,533) are continuous towns. Pop. (1910) 17,167.

Wint, PETER DE (1784-1849), English water-colour painter, born at Stone in Staffordshire, of Dutch extraction. He entered the Royal Academy in 1807. In 1810 he became an associate of the Water Colour Society, and two years later a member. Among his works, some of which are in oils, are *Lincoln Cathedral*, *Haddon Hall*, *Hay Harvest*, and *The Cricketers*. See *Memoir*, by Armstrong (1888).

Winter, the coldest season of the year, defined astronomically as beginning, in the northern hemisphere, with the sun's entry into the sign of Capricorn, about December 21, and terminating at the vernal equinox. It thus extends from the shortest day, when the sun attains his greatest southern declination, to the moment

of his crossing the equator at the ascending node of his apparent orbit. Winter in southern latitudes coincides with the northern summer.

Winter, JOHN STRANGE. See STANNARD, MRS. A.

Winter, WILLIAM (1836), American author and dramatic critic, born at Gloucester, Massachusetts; was appointed dramatic critic for the *New York Tribune* (1865). Since 1891 he has been president of the Staten Is. Academy. Among his many works are *Shakespeare's England* (1886), *The Wanderers* (1888), *The Trip to England* (2nd ed. 1880), *Edwin Booth* (new ed. 1878), *The Jeffersons* (1881), *Stage Life of Mary Anderson* (1886), *English Rambles* (1883), *Henry Irving: Studies of His Acting* (1885), *Ada Rehan* (1891), *The Theatre and The Public* (1905), *Poems* (1909), etc.

Winter Berry, a name given to the black alder (*Ilex verticillata*), a N. American shrub, with pointed oval leaves, downy on the underside of the veins. It flowers in early summer.

Winter Cherry, a hardy herbaceous plant, belonging to the order Solonacæ. It is a native of China. It bears in summer white flowers with yellow anthers. These are followed by edible scarlet berries, which persist for some months.

Winter Gardening is perhaps generally taken to refer to a sort of conservatory, in which are beds and borders of plants which would not succeed in the open air during the winter months. Tree ferns, palms, camellias, roses, araucarias, and rhododendrons are among the larger plants commonly grown. But even without glass, we may have our gardens bright with Christmas and Lenten roses or hellebores. A plant somewhat related to the hellebores is the pretty little winter aconite (*Eranthis hyemalis*). In warm,

sheltered situations, two species of *Scilla* often produce their flowers in January—*Scilla bifolia*, and *S. siberica*, with flowers of intense blue. Some of the anemones often begin to flower in winter, especially the blue wind-flower of Greece (*A. blanda*), and in warm situations the old *A. coronaria* itself. Some of the species of crocus, also, belong to the winter bloomers—notably the mauve *C. imperati*, and the pale lilac *C. pulchellus*. In sheltered shady spots, the round-leaved cyclamen (*C. coum*) and its white-flowered variety (*C. hyemale*) produce abundance of little flowers often quite early in January.

The common primrose and its garden varieties, as well as many other species of *Primula*, sometimes begin to show their flowers soon after Christmas. One of the very earliest is the purple Caucasian primrose (*P. amana*). But of all the flowers of winter the most beautiful is the fragrant *Iris reticulata*. Other fragrant species which bloom in winter or very early spring are the soft blue *Iris stylosa*, of which there is an equally beautiful white variety, and the purple and rose *Iris histrio*, somewhat resembling *Iris reticulata* in habit and colouring.

The flowers which usher out the winter include the single and double common snowdrops (*G. nivalis*), the handsome *Galanthus Elvest*, the broad-leaved *G. latifolius*, and a fragrant hybrid derived from it, *G. Alleni*. Several of the periwinkles, notably the lilac *Vinca acutiloba*, bear flowers during December and January, and in warm sheltered spots violets and roses may often be picked in the open air. Among the shrubs, several of the most beautiful bear their flowers in the depth of winter—e.g. the winter sweet (*Chimonanthus fragrans*). The *Chimonanthus* is

worth a place against a warm wall, facing south. The variety known as *C. grandiflora* bears somewhat larger flowers. The scarlet flowers of *Cydonia japonica* (the Japan quince) are familiar to every one. Other species of quince, however, are equally well worth growing—*C. Maulei*, with orange-red flowers; *C. nivalis*, with large white flowers; and *C. cardinalis*.

When the climate is mild, and the soil not too heavy, the laurustinus (*Viburnum tinus*) is of great value in winter and early spring. The yellow jasmine and the shrubby honeysuckles (*Lonicera fragrantissima* and *L. Standishi*) are easy to grow. The old *Daphne mezereum*, single and double, the double furze (*Ulex europæus flore pleno*), and the evergreen *Garrya elliptica*, with its hardier variety *Thuretii*, should all be grown.

Among the plants which bear evergreen and evergray foliage may be named lavender, rosemary, pinks, carnations, mulleins, alyssum, lavender cotton, *Stachys chrysanth*, *Achillea umbellata*, *A. moschata*, *Silene maritima*, *Hieraceum villosum*, *H. gymnocephalus*, *Cistus* (of sorts), *Artemisia lanata*, *Senecio leucophyllus*, *Teucrium aureum*, *Cerastium tomentosum*, *Arabis variegata*, *Gypsophila repens*, *Festuca glauca*, *Sedum turkestanicum*, *Olearia insignis*, *Agrostemma coronaria*, and *Onopordon arabicum*.

Wintergreen Oil, methyl salicylate, $C_6H_4(OH)COOCH_3$, is the essential oil of *Gaultheria procumbens*. It is an oily liquid (sp. gr. 1.197, b.p. 224° C.), with a pleasant smell, and is used for flavouring and for the preparation of natural salicylic acid.

Winter's Bark, the bark of an evergreen shrub, *Drimys Winteri*, belonging to the order Magnoliaceæ. It is a native of S. Amer-

ica, and bears corymbs of white flowers. The bark has aromatic and tonic properties.

Winterswijk, comm., Netherlands, in Gelderland, 25 m. S.E. of Zutphen, near the frontier of Prussia. Pop. (1910) 13,352.

Winterthur, tn., Swiss canton of Zürich, 17 m. by rail N.E. of the city of Zürich. It is a great railway centre, and possesses important factories, particularly of locomotives and other machinery. Cotton goods and wine are also produced. Pop. (1910) 25,066.

Winterton, urban dist. and mkt. tn., Lincolnshire, England, 7 m. W.S.W. of Barton-on-Humber. The town has a fine Early English church with a Norman tower. Pop. (1911) 1,426.

Winther, RASMUS VILLADS CHRISTIAN FERDINAND (1796-1876), Danish poet, born at Fensmark in Zealand; published (1828) his first volume of *Digte*; in 1841 was tutor at Neu-Strelitz to the future crown princess of Denmark. His *Nogle Digte* (1835), *Sang og Sagn* (1839), and *Haandtegninger* (1840), established his reputation as one of the leading lyrical poets of his country. His beautiful descriptions of nature are scarcely inferior to those of Wordsworth. Some of his finest work is contained in *Hjortens Flugt* (1856). He also wrote good short stories—e.g. *Tre Fortællinger* (1851). His *Samlede Digtninger* appeared in 1860. See Bögh's *Christian Winther* (1893-1901).

Winthrop, tn., Massachusetts, U.S.A., in Suffolk co., 4 m. E.N.E. of Boston; a favourite summer resort. Pop. (1910) 10,132.

Winthrop Family, an American family, originally from England. The first was JOHN WINTHROP (1588-1649), governor of Massachusetts, born at Groton in Suffolk. He landed at Salem (1630), but removed to Charlestown, where he selected

Shawmut as the site of Boston, and was governor of the new colony for many years, then deputy-governor. He opposed the doctrines of Anne Hutchinson and her followers, and was an active party to their banishment. See his *Journal*, 1630-49 (1720; by Savage, 1826, 1853); and *Life and Letters* (1864-7).—JOHN WINTHROP (1606-76), governor of Connecticut, born at Groton, son of preceding; took part in expedition (1627) for relief of Huguenots of Rochelle. He followed his father to America (1631), and became (1635) governor of Connecticut, afterwards founding the city of New London, of which he was governor (1657-76). Sent to England (1661), he procured a charter from Charles II., uniting Connecticut and New Haven into one colony, of which he was the first governor. He was an accomplished scholar, and one of the founders of the Royal Society of London.—FITZJOHN WINTHROP (1639-1707), son of the preceding, took part in the Indian wars; was agent in London for Connecticut (1693-7); and governor of the colony (1698-1707). See *The Winthrop Papers* (1889).—The next Winthrop of distinction was also a JOHN (1714-79), a mathematician and fellow of the Royal Society of London. He observed the transit of Venus at St. John's, Newfoundland (1761), and wrote treatises on earthquakes, and was a close friend of Benjamin Franklin.—ROBERT CHARLES WINTHROP (1809-94), orator, politician, and man of letters, a native of Boston; entered the State legislature (1835); was its speaker (1838-40); member of Congress (1840-2 and 1843-50); speaker again (1847-8); and senator (1850-1). He wrote *Addresses and Speeches* (1852 and 1867), *Life and Letters of John Winthrop* (1864-7), and *Memoir of Nathan Appleton* (1861).—

THEODORE WINTHROP (1828-61), soldier and author, born at New Haven; visited California, Oregon, and Vancouver I., and accompanied the expedition of Strain to explore the isthmus of Darien. He became a barrister, and eventually military secretary to General Butler in the civil war, but was killed in the battle of Great Bethel in Virginia. He wrote, among other works, *Cecil Dreeme* (1861), *John Brent* (1862), *Edwin Brothertoft* (1862), *Canoe and Saddle* (1862), and *Life in the Open Air* (1863).

Winton, bor., Pennsylvania, U.S.A., in Lackawanna co., 7 m. N.E. of Scranton. It is a coal-mining centre. Pop. (1910) 5,280.

Winzet, or **WINGATE**, **NINIAN** (1518-92), Scottish controversialist, born in Renfrew. He became one of the most strenuous supporters of the Roman Catholic cause in Scotland, opposed John Knox, and published irritating polemical tracts and pamphlets. He was exiled in 1563, and instituted (1577) abbot of the Benedictine monastery at Ratisbon. He wrote a reply to Buchanan's *De Jure Regni*. See Scottish Text Society's reprint of his *Certain Tractates* (1891).

Wipperfurth, tn., Rhenish Prussia, 22 m. N.E. of Cologne. Pop. (1910) 6,765.

Wire and Wire-Drawing.

Nearly all metals can be drawn, the extent and ease of drawing depending upon the ductility of the metal. Such metals as antimony and bismuth, owing to their extreme hardness, can only be drawn with great difficulty, and are then of little or no use, owing to their want of flexibility. Numerous wires are composed of alloys, such as iron and carbon, making steel wire, iron-nickel, brass, iron-aluminium, and copper-nickel. Gold wire is mentioned in Exodus 39 as being used in the dress of the high

priest. This was probably made by beating out the gold into thin sheets, then slitting it, and smoothing the edges of the strips, so as to give them a round form.

The *modus operandi* now in vogue for drawing iron and steel wire is as follows. The billets or ingots are heated to a bright red heat, and passed through rollers with diminishing holes, being first rolled on the one side and then on the other, until they assume the form of a round wire rod of about $\frac{1}{2}$ in. in diameter. When the rod issues from the last roller, it is wound on to a rotating reel, and is then ready for the drawing process. It is first thoroughly cleaned, all the oxide or scale which adheres to it being removed by plunging into an acid bath. In high-class steel wire this is used cold, but in the cheaper grades, such as fencing wire, the acid is heated by steam. The rod is next well washed in water, and then dipped into boiling lime, to neutralize any acid that may still be left, and is dried quickly in a hot stove. The wire-drawer then takes it and puts one end into the die. In this holes are punched in the form of a sugar loaf, the end of the hole being very carefully finished to the right size. As it passes through the die, the wire is attached to a vice situated on the top of the block or drum, round which it is wound. When the hank of wire has all passed through the die, it is taken off the drum or block, and the same process is repeated through dies of diminishing sizes until the desired size is obtained. The process of annealing consists of heating the coils to a red heat in a hermetically sealed chamber, and allowing them to cool slowly. Every time this is done it is necessary to clean the wire in the acid again before drawing. For some classes of iron and steel wire, the wire is

coated after it has been cleaned in a bath of sulphate of copper to form a thin coating of copper.

There have been numerous machines invented for drawing wire through as many as twelve dies at one time, but these have only been successful for the softer and more ductile metals, such as brass and copper. Soft iron wire has also been drawn through a number of dies at one operation in the smaller sizes. In these machines the wire has to be drawn wet. For very fine wires, dies of precious stones, such as diamonds and rubies, are used. Commercially the standard sizes of wire conform to certain recognized gauges. That most commonly quoted is Birmingham wire gauge, which has some forty measurements, ranging from No. 0000 = $\frac{1}{64}$ -inch to No. 36 = $\frac{1}{16}$ -inch.

Steel wires of great strength have been made of late years, 130 tons tensile strength per square inch being quite common. This class of wire is used for ropes, pianos, springs, and so forth. The wire is hardened and tempered to a nicety before the drawing process. This class of wire has also great toughness, and stands severe torsion and flexure tests. Wires of great length have been drawn without weld or joint. A silver wire 170 m. long has been drawn through a hole in a ruby which was $\frac{1}{16}$ of an inch in diameter. Platinum wire of great fineness has been drawn by covering the platinum with silver, then drawing this down as fine as practicable, and dissolving the silver off, leaving the platinum. This wire was calculated to be $\frac{1}{1000000}$ of an inch in diameter, and was intended to take the place of spider lines in telescope and other scientific apparatus.

Although wire is mostly cylindrical in form, it is often drawn square, oval, half-round, flat, triangular, and as the grooved

pinion wire, from which the wheels of clocks and watches are cut. In weaving wire for netting, wirecloth, barbed wire, special automatic machinery is used, which takes the wire from the coil and turns out the finished article. Enormous quantities of copper wire are exported from Britain in the shape of cables and dynamos for electrical work. Of late, aluminium wire has come into favour, owing to its lightness and high conductivity, and is being used in some cases in place of copper.

Wire-drawing, a term applied to the throttling of steam in the passages of the cylinder of a steam-engine. When these passages are contracted, the steam enters at a less speed than that of the piston towards the end of its stroke, thus setting up the throttling effect.

Wireless Telegraphy. The general principles of wireless telegraphy are noticed under ELECTRO-MAGNETIC WAVES, so space will be devoted here only to a review of the apparatus used by successive experimenters.

Wireless telegraphy proper had its practical inception in 1888, when Heinrich Hertz of Karlsruhe, Germany, experimentally demonstrated the existence of electric waves and devised means for producing and for receiving them. This was followed by a series of experiments in 1890 by Eduard Branly of Paris, France, who brought out a sensitive detector for manifesting the presence of the electric waves, to which he gave the name 'radio-conductor.' This device was improved upon by Sir Oliver Lodge of Birmingham, and called by him the 'coherer,' and by William Marconi was subsequently perfected and used in his wireless telegraph receptor.

The earliest receptor for receiving and indicating electric waves

was designed as a meteorological instrument for plotting the differences of atmospheric potentials. This receptor, shown in Fig. 1, was due to Alexander Popoff, of St. Petersburg, Russia, in 1895, and comprised a coherer, a relay, a tapper to decohere the filings, and an automatic register as well as an aerial wire and an earthed terminal, adjuncts that were indispensable features in early wireless receptors.

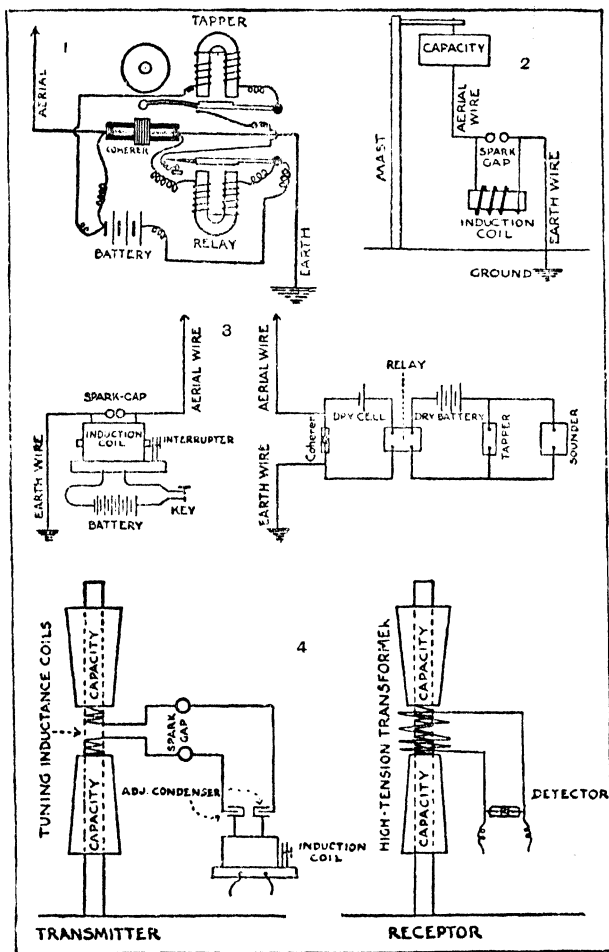
The first patent on an electric wave telegraph system was granted to William Marconi in England in 1896, and his specifications and drawings reveal that his transmitter, as will be observed by referring to Fig. 2, comprised a Hertz oscillator, energized by an induction coil, a vertical wire attached to one side of the spark-gap, and an earthed plate attached to the opposite side. Hence this inventor was the first to produce a transmitter capable of covering long distances, and he is also entitled to the credit of being the first to employ a Hertz oscillator and a Branly coherer in a practical working wireless telegraph system. This evolved wireless telegraph system is shown in Fig. 3, and is known as a simple open circuit system, in which neither tuning nor syntonizing is employed.

Early in the history of the art Lodge designed a syntonik system—viz. a sending and a receiving apparatus which could be tuned to the same period of oscillation (Fig. 4); this he accomplished by introducing into the oscillation circuits inductive coils and condensers, when it was assumed that the transmission and reception of a number of messages in the same field of force simultaneously and without interference would be possible. This was the first attempt not only to tune the respective circuits of the transmitter and the

receptor, but to couple closed circuits, which permitted persistent oscillations to surge through them, to open circuits which quickly damped out the energy of the high potential currents.

Based on the wireless telegraph system of Marconi and the syntonik experiments of Lodge, a large number of arrangements have been devised as the result of a desire either to increase the signalling distance or to effect selectivity. The chief systems in use at the present time are the Marconi, the Lodge-Muirhead, the Fessenden, the De Forest, the Telefunken, the Popp-Branly, and the Poulsen.

The present Marconi system, like all others now in practical use, is tuned and syntonized. The transmitter shown in Fig. 5 is provided with a coil giving a 10-inch spark; the primary circuit includes the inductor of primary winding of the coil, a simple spring interrupter, and a key to break up the energizing current into dots and dashes. The energy used is obtained from the lighting main of a 110-volt direct current circuit. The terminals of the secondary coil are connected with the opposite sides of the spark-gap, while the primary winding of a high-tension transformer, a battery of 12 Leyden jars, and the spark-gap, form a closed circuit. The terminals of the secondary of the high tension transformer are connected respectively to the aerial wire and the earthed terminal. This forms a 'loose coupled' oscillation system. The receptor now employed in the Marconi system eliminates the coherer and the relay, tapper, and register formerly employed, and with these complicated elements removed the action and operation of the receptor is exceedingly simple. The new magnetic detector comprises a small glass tube (Fig. 6), on which is



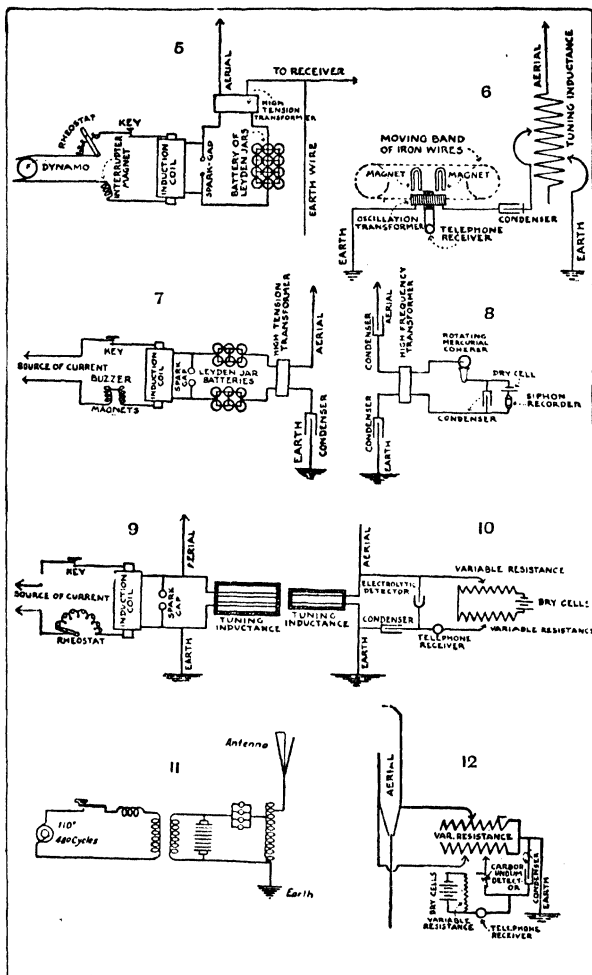
Wireless Telegraphy.—I. Figs. 1-4. (For explanation, see text.)

wound a primary coil made of a single layer of wire; one of the terminals leads direct to the earth, while the opposite one leads to the aerial and the earth through a tuning inductance coil by means of flexible conductors. The secondary coil is wound around the primary, and is connected with a telephone receiver. A flexible band formed of iron wires and held in position by two opposed grooved wheels is caused to move through the glass tube. Two steel horseshoe magnets are placed in close proximity to the moving band of wire. When the incoming waves impinge upon the aerial wire and are converted into electric oscillations, the magnetic intensity of the band is disturbed and currents are set up in the primary coil; these induce currents in the secondary, and in turn operate the telephone receiver, which indicates the dots and dashes by a series of clicks.

In the Lodge-Muirhead transmitter the primary circuits include the usual source of electromotive force, the inductor of the induction coil, the interrupter, and a 'buzzer,' a device employed to open and close the primary circuit so that a definite frequency is obtained. In this system a Morse key is used in connection with a perforator, a mechanism for preparing a message at leisure and dispatching it with celerity. This is done by passing a tape through the perforator; by means of this arrangement the message may be punched in the tape whenever convenient; in order to transmit the message the tape is passed through an automatic transmitter, and may be sent as rapidly as desired, since a brush passes over the perforations in the tape, and thus closes the circuit. The oscillation system comprises an open and a closed circuit, as shown in Fig. 7. The aerial is

connected with the earth through the primary of a high tension transformer and a high potential condenser. The secondary winding of the transformer is connected in series with the spark-gap through adjustable condensers, thus forming a closed circuit, while the spark-gap is connected with the secondary terminals of the induction coil. Hence the circuits are 'loose coupled.' The complementary receptor (Fig. 8) for the above transmitter includes an open circuit system in which the aerial and the earth wires are connected through two adjustable condensers and an inductance coil; the winding of the latter forms the primary of a high frequency transformer. The secondary of the transformer is connected in series with a rotating mercurial coherer and a siphon recorder, which inscribes the incoming messages on a tape. These circuits are, like those of the transmitter, loosely coupled.

The transmitter of the Fessenden system presents some novel features, as a reference to the diagram, Fig. 9, will show. The terminals of the secondary of an induction coil are connected with a multiple spark-gap in the usual manner, while the closed oscillation circuit includes a variable inductance formed of a number of parallel wires immersed in oil having a high dielectric capacity. The aerial and earth wires are connected directly to opposite sides of the closed circuit, and therefore this transmitter is said to be 'closely coupled.' The receptor used in conjunction with this transmitter is the most sensitive of any yet devised, employing as it does Fessenden's electrolytic detector, or liquid barretter. In its simplest form this detector consists of a fine platinum wire a few thousandths of an inch in diameter, one end of which is immersed in a dilute solution of acid



Wireless Telegraphy.—II. Figs. 5-12. (For explanation, see text.)

contained in a platinum vessel about the size of a lead-pencil. The receptor shown in Fig. 10 is a close-coupled system like that of the transmitter, the tuning being accomplished by means of a gird of wires immersed in oil.

The De Forest system differs from those above cited in that an alternating current is used as the initial source of energy for the transmitter instead of a direct current, and a transformer is consequently utilized instead of an induction coil. Recent developments of this system are embodied in the new 'Radiotone' or high-note system controlled by the Radio Telephone Co. Alternating current at 500 cycles per second is employed (Fig. 11). By a resonance transformer the initial voltage is raised to 15,000 volts; a special self-muffled spark-gap and tubular glass condensers are in the primary circuit. The oscillations set up in the antenna circuit are very persistent; and having but a single frequency, instead of the usual double frequency, they are sharply tuned. The primary oscillations are completely 'quenched'—i.e. damped; which gives the note at the receiving station a high, perfectly clear, musical quality, very penetrating and easy to read amid atmospheric disturbances and interference from other stations. The over-all efficiency of this new 'system' is 60 to 75 per cent.; that of the old spark sets rarely exceeds 15 per cent. As a result, a Radiotone station employing 2 kilowatts can cover distances which required 20 kilowatts or more by the older methods. Dr. Seibt, who claims his work on the quenched spark antedates that of Max Wien, has added to this system a photographic tape recorder, which is said to record signals as weak as the ear can detect, and at speeds of transmission as high as 100 words per minute. The

De Forest Audion is the detector ordinarily employed in this system (Fig. 12). This is a small incandescent lamp with special electrodes and circuits; it is acknowledged to be one of the most sensitive of detectors.

The new Telefunken system is a combination of the Braun and

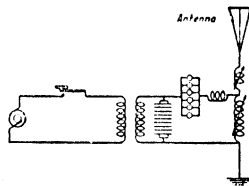


FIG. 13.

Slaby-Arco systems, revolutionized by Arco and his assistants along the lines indicated by the theoretical investigations of Max Wien on the quenched spark. It also employs alternating current in the primary circuit, and a special spark-gap made up of several small gaps of large opposed surfaces in series (Fig. 13).

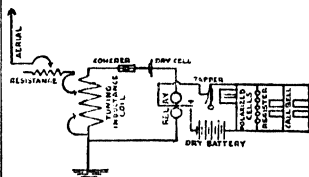


FIG. 14.

The detector used is generally the electrolytic detector or the crystal rectifier (Fig. 14). Because of the low voltages employed in this system, no difficulty is encountered in insulating condensers and inductances.

Both this and the 'Radiotone' system use closed tuned circuits,

without sliding contacts for adjusting frequencies, thus keeping damping losses down to a minimum. Interference from signals differing by only one per cent. in wave length can be prevented by these systems.

A system designed by Eduard Branly and Victor Popp, of Paris, consists of an induction coil, and an interrupter of the mercury turbine type driven by an electric motor. The high-tension circuits include a tuning-coil not unlike those previously described. The chief difference between this system and the preceding ones lies in the design of the receptor, which employs the Branly tripod coherer. This consists of two steel discs, in one of which three metal rods with rounded ends are fixed, forming a small tripod. The ends, which are oxidized, rest on the polished surface of the second disc. The coherer is set at the rear of the register, and when the latter is in operation a lever attached to the armature serves to tap the coherer. The current from a dry cell energizes the coils of the polarized relay when the resistance of the coherer drops to a minimum value due to the action of the oscillations, which impress their energy upon it when these are set up by the incoming electric waves.

In all of the systems described above, various means for tuning and synchronization are resorted to; but since the electric waves emitted by oscillations set up by a disruptive discharge are in any case periodic, and decrease in geometrical ratio, and moreover since a long period of time must necessarily elapse between the successive trains of waves, the resonance effects obtained by these means are not nearly great enough to make selective signalling possible. As we have seen, an open circuit damps out the oscillations in one or two swings, and though the

oscillations in a closed circuit are much more persistent, even under the most favourable circumstances they are by no means continuous. If electric oscillations could be set up that would take on a sine wave form and be continuous instead of periodic, a degree of resonance could be obtained between a transmitter and a receptor tuned to it that would enable the latter to respond to the former and keep all others out, thus following the analogy of the sympathetic tuning forks.

To obtain such sustained electric oscillations Valdemar Poulsen, of Copenhagen, has designed a new type of generator in which the spark-gap plays no part. His transmitter is based upon an effect

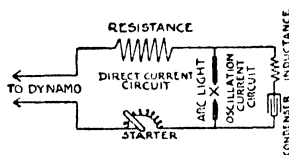


FIG. 15.

first noted by Elihu Thomson in 1893, and which was brought out in 1900 by W. Duddell under the name of the musical arc. The apparatus consisted of an arc light fed by a direct current, and around which is shunted a condenser in series with an inductance coil as shown in Fig. 15. When certain conditions are satisfied the arc light will give out a musical note, and at the same time will transform a portion of the direct current into alternating currents which are constant in amplitude. Acting upon this suggestion, Poulsen succeeded in increasing the frequency of the currents produced in the secondary circuit by placing a spirit lamp under the arc, producing oscillations at the rate of millions per

second. When an ordinary ammeter was placed in the direct current circuit and a hot-wire ammeter for measuring high-frequency currents was inserted in the closed condenser circuit, the meters indicated that about 30 per cent. of the initial energy of the direct current was transformed into electric oscillations, while the ratio of transformation was increased to 50 per cent. when the arc was formed in hydrogen gas.

From what has been said, the advantage of employing such sustained oscillations for the production, propagation, and reception of electric waves for wireless telegraphy is obvious, and by properly tuning the sending and the receiving open and closed circuits, any length of wave can be produced and utilized and the maximum resonance effects thus obtained. It is stated on good authority that a dozen messages have been sent and received between as many sets of instruments without interference, and if this extraordinary result can be duplicated over a distance of 100 miles, as the tests between the inventor's proving stations indicate, an advance has been made in the art that is second only to the introduction of wireless telegraphy itself.

Recent improvements in wireless telegraphy have served to increase materially its range and efficiency. On land, signals have been received by stations on the Atlantic coast from those on the Pacific; while on Oct. 17, 1907, the Marconi Wireless Telegraph Co. inaugurated a regular transatlantic service between stations at Clifden, Ireland, and Glace Bay, Nova Scotia. Commercial business was undertaken at rates considerably lower than those of the cable companies.

The greatest demonstration of the importance and possibilities

of wireless telegraphy was made on Jan. 23, 1909, when the White Star liner *Republic* was rammed by the Italian liner *Florida* during a heavy fog, at a point 45 m.s. by E. of Nantucket Light, Massachusetts, and wireless messages following the 'C. Q. D.' signal of extreme danger from the stricken vessel brought immediate succour by land and sea. The *Florida* hove to, the White Star liner *Baltic* caught the message of peril and hastened to the rescue, as did also a number of government vessels. The *Republic* sank, but through the operation of wireless telegraphy, out of over 1,000 lives in peril at the time of the collision only six were lost.

Consult Fahie's *History of Wireless Telegraphy* (1902); Collins's *Wireless Telegraphy: Its History, Theory, and Practice* (1904); Collins's *Manual of Wireless Telegraphy* (1906); J. A. Fleming's *Principles of Electric Wave Telegraphy and Telephony* (2nd ed. 1910); and J. Erskine Murray's *Handbook of Wireless Telegraphy* (3rd ed. 1911).

Wireless Telephony. The first attempts to telephone without wires utilized the principles of electro-magnetic induction, or of conduction by leakage currents in earth or water, between transmitter and receiver. Parallel coils of wire, each of many turns, and enclosing as large an area as possible, were used. A battery and microphone in the transmitter circuit and a sensitive telephone receiver in the receiver circuit were the necessary instruments. Since the electro-magnetic effects diminish with the inverse cube of the distance, voice transmission over short spaces only is feasible by this first method. In the conduction method metal plates were buried in the earth a long distance apart and connected by an overhead wire strung on poles. In the

centre of this wire were connected a battery and microphone transmitter. At the distant receiving station a second wire was strung parallel to the first, its ends also connected to plates in the earth or water. In a telephone receiver inserted in this wire could be heard faint reproductions of words spoken in the transmitter, due to the stray or leakage currents passing through the earth between the buried plates. But the distance of transmission here can be but little greater than the length of one of the two parallel wires.

In 1893 Dr. Alex. Graham Bell demonstrated voice transmission over a beam of light from an arc lamp placed at the focus of a parabolic reflector. A few years ago Simon and Ruhmer in Germany greatly improved on Bell's apparatus. A microphone circuit was associated with the line supplying the arc light, so that, when the microphone was spoken into, slight variations in the light of the arc resulted. The receiving apparatus consisted of a sensitive selenium cell, also mounted at the focus of a parabolic mirror into which the arc light was directed. The electrical resistance of the cell is affected by the intensity of the light falling thereon and roughly proportionally thereto, and a telephone receiver in series with this cell and a dry battery therefore faintly reproduces the sound of the voice at the transmitter.

Distances of twelve miles have been covered by this light method, but its many obvious disadvantages, of which interference by fog is the greatest, render it impracticable.

Wireless telephony by Hertzian waves was first accomplished publicly in 1906, the demonstrations being made about the same time in America, Germany, and Denmark. Among the first patent

applications filed in America disclosing practical methods for radiotelephony are those of De Forest (in July 1902), and of Fessenden (in Sept. 1901, and June 1902).

The method of De Forest was to generate electrical waves by a series of spark discharges of relatively small intensity, either continuously, or at such frequency that the sound therefrom at the receiving station would be inaudible. This discharge frequency should exceed 100,000 per second. The amplitudes of the successive waves were influenced by a microphone transmitter associated with the wireless transmitter circuit. In this manner its changes of resistance when spoken into produced a corresponding wave of audible frequency, which wave was, so to speak, built upon the amplitudes or peaks of the Hertzian waves. The transmitter affects the current by about 5 per cent. only. At the receiving station the upright wire or aerial system is in tune with the frequency of the transmitted Hertzian waves. Associated with this aerial system is a closed secondary circuit containing a carefully built inductance and a variable capacity. Across the terminals of the latter is connected a sensitive detector, which must give a change in its resistance exactly proportionate to the intensity of the high-frequency electrical currents traversing it at that particular instant. The response must be 'quantitative' and instantaneous. There may be no time lag in the recovery of the detector.

The methods at present employed by Fessenden depend on the use of a high-frequency alternator capable of supplying considerable energy at 50,000 to 100,000 cycles per second. Such generators have been developed for this purpose by Mr. Alexan-

derson of the General Electric Co., the power supplied in the latest being 2 kilowatts. The terminals of the alternator may be connected directly to the foot of the antenna and the ground connection. A special form of non-packing carbon transmitter may be inserted directly in the ground connection, or in some associated circuit. Its action is the same as in the above-cited case. For receiving, the 'heterodyne' receiver is used. This is a form of telephone depending on the repulsion of circuits carrying alternating currents of the same frequency. A 'balance' form of interference preventer may be used. The most recent improvements in this system are telephone relays for transferring the speech from a wire line to wireless circuits and *vice versa*, 'phantom aerial' circuits which permit of simultaneous sending and receiving, and increases in the output of the alternators.

Of the forms of detectors which may be used in wireless telephony, the following may be mentioned as suitable: crystal rectifiers, thermo-couples, and gas valves. The crystal rectifiers which are actually used are carborundum, silicon, 'Perikon,' 'Radion,' etc. Of the forms of gas valves used, the Audion of Mr. De Forest is one of the most suitable. In this responder the sensitive medium is ionized rarefied gas in a small incandescent lamp. The electrodes are sealed in the bulb and consist of a plate, and a grid of platinum wire, in addition to the customary filament. The positive terminal of a battery is connected to the platinum plate. The negative side is connected through a high-resistance telephone receiver to the filament, which is lighted from a separate battery. The terminals of the high-frequency receiving circuit are connected to the fila-

ment and to the platinum grid respectively (Fig. 1). When slight changes of potential are impressed on this grid, the electrons or ions, passing from the positive plate through the gas to the filament, are deflected or retarded to a considerable degree, and the direct current passing through the tele-

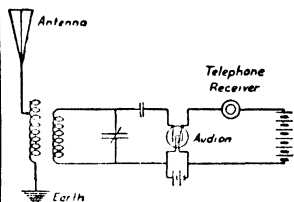


FIG. 1.

phone receiver is accordingly affected, and to a proportionate amount. There is no appreciable lag in so delicate and tenuous a medium, and this receiver is therefore frequently used in radiotelephony. It was employed in the recent experiments of Majorana during which wireless telephonic communication was established over distances of more than 200 miles from Rome, the sending station.

The Duddell or 'singing' arc, as modified by Poulsen, affords a very easy method of securing continuous radiation of electric waves of substantially constant amplitude. (See WIRELESS TELEGRAPHY.) The microphone circuit can be associated with the inductance coil of the primary oscillating circuit, as shown in Fig. 2, or inductively associated with one of the leads supplying direct current to the arc (Simon). Or the microphone may be associated with one of the field windings of the supply generator. By these means fluctuations of the oscillating currents, or of the

current passing across the arc, are obtained, in accordance with resistance changes produced in the microphone by the voice. The Telefunken Company has used a number of modified Poulsen arcs in series as the generator for the high-frequency oscillations, and Fessenden has also employed

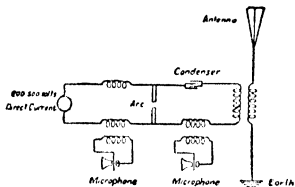


FIG. 2.

high-voltage arcs burning in a compressed gas for the same purpose. John Stone, following the discovery of Elihu Thomson, used an arc with water-cooled electrodes in air and a direct voltage of several thousand volts. This avoids to some extent the wasting away of the carbon electrodes and the irregularities and frequent adjustments of the arc.

In the early De Forest sets, in which the carbon-copper arc was used as a generator, the microphone was placed directly in the ground circuit of the antenna, and as near the earth as possible (Fig. 3). To avoid destruction of the microphone from high voltages it is generally necessary to place the microphone in the earth side of the circuit. This is an arrangement now frequently employed both in Europe and America. In the newest De Forest sets a specially constructed 'Oscillator' is used in place of the arc. This employs cooled electrodes, and burns in an artificial atmosphere, but without the necessity for high voltages. The system is sufficiently simple

to be operated by one not an expert, and is capable of voice transmission from ordinary antenna of 50 to 150 miles. Professor Majorana uses a water jet vibrated by the transmitter, and a film of water the thickness of which on a plate forming part of the circuit is varied by the action of the jet.

The ordinary microphones are destroyed if one ampere or more is passed through them for any length of time. For fifty miles and greater ranges, currents of one and one-half to three amperes are required in the antenna of the transmitting station. This calls for specially designed microphones with large amounts of carbon granules and large electrodes; or else for water-cooled microphones. De Forest employs a microphone in which each electrode, and the carbon-containing chamber as well, are water-jacketed. The same water-circu-

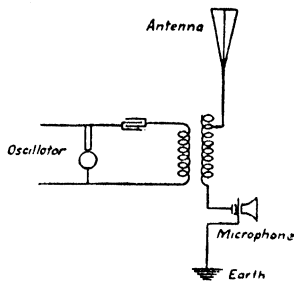


FIG. 3.

lating system used to cool the electrodes of his oscillator serves also to cool the microphones.

For very large currents, such as are needed for much greater ranges of wireless telephony than are yet successfully covered, a new principle will probably replace the carbon microphone. De

Forest has suggested a monometric gas flame, rendered electrically conducting, and controlled by the speaker's voice.

A current-governing, voice-controlled medium of this nature will be capable of governing very large amounts of energy in an instantaneous manner, and seems to offer the key to the problem of long-distance wireless telephony.

The arc system has been most successful up to date, and has advantages as regards cost and compactness. On the other hand, the alternating system is more consistent and controllable, and for this reason may ultimately take first place.

It should be noted that the conduction system has been developed recently by Mr. A. W. Sharman to an extent which justifies the belief that it may yet be widely used under certain conditions. The speaking apparatus consists of a microphone, battery, and impulse coil, arranged in series. The battery develops an energy of but a few watts. Tappings are taken off the circuit by electrodes sunk in the ground or water. The radiating waves of energy are caught by a receiving circuit, which includes two similar electrodes in series with a telephone receiver. With the aid of a very small and compact apparatus speech has been transmitted several miles, the results being surprisingly good considering the trifling amount of current used. Further development of the system appears to be dependent on the invention of microphone transmitters which will enable heavy currents to be employed.

Until recently it was not possible for two speakers using the wireless telephone to talk back and forth without each alternately throwing a switch from 'sending' to 'receiving.' This made conversation slow and liable

to interruption. The same state of affairs existed in the early days of the wire telephone; in speaking it was necessary to depress a button, which had to be released again before the speaker could hear anything that the distant speaker might wish to say. Dr. De Forest has evolved now a 'duplex' system whereby it is possible for one even while speaking to hear the voice of the speaker at the distant transmitter.

This is accomplished by a 'balanced circuit,' whereby the home detector is not affected by its own transmitter, except when speaking is actually going on, but is always responsive to the energy transmitted from the distant station. It is still necessary that the receiver circuit and the distant transmitter circuit be attuned to the same frequency.

Twenty-six of the United States battleships were fitted out with the early form of De Forest apparatus. The present apparatus, however, is an improvement in almost every detail over the early sets, giving increased range, power, and ease in manipulation.

On account of the greater facility of voice communication, and also from the fact that the voice can be distinguished amid interference much more easily than can telegraphic signals, the wireless telephone seems to be destined to have a wide field of application, particularly for naval and military communication, for isolated stations in rural and mountainous or arctic regions, between ranches, mines, lighthouses, and for the lake and coastwise merchant marine.

The claimed ranges for the most prominent systems follow: Telefunken system, 40 miles. Poulsen system, 175 miles over land, 350 miles over water. Majorana, 175 miles over water. De Forest, 50 to 150 miles. Fessenden, 200 miles over land, and using relays

to and from wire lines at sending and receiving stations, 12 miles over water.

References: Mayer's *Handbook of Wireless Telegraphy and Telephony* (1909); Erskine Murray's translation of Ruhmer's *Wireless Telephony* (1909); and J. A. Fleming's *The Principles of Electric Wave Telegraphy and Telephony* (2nd ed. 1910).

Wireworm. (1.) A name given to the larvæ of click-beetles, on account of the shape of the body and the toughness and hardness of the skin. These larvæ are extremely destructive to all sorts of garden and field crops, upon whose roots or underground stems they feed. The larval life extends up to five years. The usual length of the larva is $\frac{1}{2}$ in. to $\frac{3}{4}$ in., and there are three pairs of legs. At the end of larval life pupation takes place in the ground, from which the imago emerges. Common species are *Agriotus lineatus* and *A. sputator*. The natural enemies of the wireworm are the pheasant, the rook, the mole, and the plover. As remedies for their attacks, dressings of lime, salt, nitrate of soda, and so on, have been recommended; also trapping with slices of potato or turnip, a remedy obviously only applicable on a small scale. (2.) The name wireworm is also given to the destructive millipedes found in gardens, especially to species of *Julus*.

Wiring. ELECTRIC. See ELECTRIC LIGHTING.

Wirksworth, urb. dist. and mrkt. tn., Derbyshire, England, 12 m. N. by w. of Derby. There are lead mines and stone quarries, and manufactures of cotton, hosiery, hats, tape, and silk. The 13th-century church of St. Mary's is Early English in style. Pop. (1911) 3,888.

Wirsén, CARL DAVID AF (1842), Swedish poet, born in Uppland, taught at Upsala (1868-75).

His chief works are *Dikter* (1876), *Nya Dikter* (1880), *Sånger och Bilder* (1884), *Toner och Sånger* (1893)—all remarkable for deep feeling, native piety, and rare perfection of style. In 1879 he was elected a member of the Academy. His further works include *Andliga Sånger* (1898), *Ellen Keys Lifsåskådning och Verksamhet som Författarinna* (1900), and his own *Lefnadsteckningar* (1901).

Wisbech, munic. bor. and port, Cambridgeshire, England, 21 m. E.N.E. of Peterborough, on the Nene, here navigable for large vessels. The manufactures include agricultural implements, beer, and oil cake. Fruit is extensively grown. Birthplace of Thomas Clarkson, the abolitionist (1760-1846). Pop. (1911) 10,828.

Wisby, or VISBY, tn., cap. of isl. and gov. of Gotland, Sweden, and an episcopal see, on w. coast. The well-preserved ruins of its walls testify to its ancient greatness. The cathedral (1190-1225) is still preserved. The town exports corn, cement, chalk, and sugar. From the very earliest times it was a place of commercial importance. This position it owed to its central situation in the Baltic; and under the Hanseatic League it was independent and prosperous till destroyed by Valdemar IV. of Denmark in 1361. In those days it had a population of 20,000. It gave name to a code of sea-laws, compiled in the middle of the 13th century. Pop. (1911) 9,961.

Wischau, tn., Austria, in Moravia, 19 m. E. by N. of Brünn; has a palace of the archbishops of Olmütz. Pop. (1911) 6,220.

Wisconsin, one of the northern central states of the United States of America, with an area of 56,066 sq. m., of which 810 sq. m. are water. It includes the Apostle Is. in Lake Superior, and several islands in Lake Michigan. It was organized as a territory in 1836,

and admitted as a state in 1848. The surface presents little relief, except minor features produced by the erosion and deposition of the Laurentian glacier, which also left its traces in the form of many lakes, ponds, and marshes. The northern part of the state was originally heavily forested with valuable white pine, much of which has been felled. The capital is Madison, but the chief city is Milwaukee. A large and rapidly growing city is Superior, at the head of Lake Superior. The farming industries are very great, especially in the southern half of the state. The principal crops are oats, Indian corn, barley, wheat, rye, and tobacco. The leading manufactures are lumber, flour, foundry and machine-shop products, cheese, butter, and condensed milk, leather, malt liquors, slaughtering and meat-packing, paper and wood pulp. The mineral wealth consists mainly of iron ore, found in large quantities in the north-eastern part of the state. In the south-western part lead and zinc are mined. Limestone, granite, and mineral springs also occur. The University of Wisconsin at Madison had 4,500 students in 1910, Marquette University at Milwaukee 1,633 students, and Lawrence University at Appleton 639 students. Pop. (1910) 2,333,860. See R. G. Thwaites's *Wisconsin* (1909), and Phelan's *Financial History of Wisconsin* (1908).

Wisconsin, riv., rises in N. of Wisconsin, and flows s. and s.w. to join the Mississippi, 3 m. s. of Prairie du Chien. It is 600 m. long, and is navigable to Portage (200 m.), whence it is connected by canal with Fox R. and Lake Michigan.

Wisdom, BOOK OF. See ECCLESIASTICUS; PROVERBS.

Wiseman, NICHOLAS PATRICK STEPHEN (1802-65), cardinal archbishop of Westminster, was of

Irish extraction, but born at Seville. At sixteen he was entered at the English College at Rome, of which he became rector in 1828. He soon became known as an able lecturer, both in Rome and in London, making popular such subjects as 'The Connection between Science and Revealed Religion.' His discourses on the *Doctrine of the Catholic Church* attracted much interest in England (1835-6). In 1836 he established, in conjunction with Mr. O'Connell, the *Dublin Review*, to which he was a regular contributor. In 1840 he was made coadjutor vicar-apostolic of the central division of the Roman Catholic Church in England, with the title of bishop of Melipotamus; also president of St. Mary's College at Oscott. In 1846 he was transferred to London. When the Roman hierarchy was restored in England in 1850, Wiseman was made archbishop of Westminster and cardinal. His name was associated with art, culture, and progress. Among his lighter works is *Fabiola, or the Church of the Catacombs* (1854); and a drama, *The Witch of Rosenberg* (1866). See *Life* by Wilfrid Ward (1897; new ed. 1900).

Wiseman, RICHARD (?1622-76), English surgeon, was born in London. In 1643 he joined the royalist forces, and ultimately became medical attendant to the Prince of Wales. He was taken prisoner at Worcester (1651), and after his release practised in London, and engaged in conspiracies against the commonwealth. At the restoration he became surgeon to Charles II. He was one of the first of his profession to lift surgery above mere blood-letting. See Sir T. Longmore's *Biographical Study of Richard Wiseman* (1891).

Wishart, GEORGE (?1513-46), Scottish Protestant martyr, was

probably the younger brother of James Wishart of Pittarrow in Forfarshire. In 1538 he was summoned by Bishop Hepburn on a charge of heresy for teaching the Greek Testament, and fled to England. Either he or another of the same name in the following year recanted at Bristol on a charge of heresy for what was interpreted as denial of the merit of Christ, after which time he went abroad; and while in Switzerland he translated *The Confession of Faith of the Churches of Switzerland* (1548), reprinted in the *Wodrow Miscellany*, vol. i. (1846). About 1542-3 he was residing in Corpus Christi College, Cambridge; but in the summer of 1543 (not 1544, as stated by Knox) he returned to Scotland. He was arrested, 16th January 1546, while on a preaching tour in the Lothians. After trial at St. Andrews for heresy, he was condemned to death, and on 8th March he was strangled and burned. His preaching and martyrdom gave an impetus to the reformation doctrines. See Knox's *Works* (ed. Laing); Foxe's *Book of Martyrs*; Rogers's *Memoirs of George Wishart* (1876); Cramond's *Truth about George Wishart* (1898).

Wishart, GEORGE (1599-1671), bishop of Edinburgh, was born in Haddingtonshire; he acted as secretary to Archbishop Spotsiswoode, and held charges first at Monifieth and then at St. Andrews, where he came under Montrose's influence. Wishart joined in the exodus when the period of Presbyterian ascendancy began (1638), and settled at New-castle, where he was taken prisoner and brought to Edinburgh (1644) and imprisoned. On his release he joined Montrose, was present at Philiphaugh, and fled with Montrose to the Continent, where he became minister of the Scots church at Schiedam. In

1662 he was appointed bishop of Edinburgh.

Wishaw, tn. and pol. bor., Lanarkshire, Scotland, 15 m. by rail E.S.E. of Glasgow; has railway wagon works, blast furnaces, iron works, engineering works, and coal mines. Pop. (1911) 25,263.

Wislicenus, HERMANN (1825-99), German historical painter, born at Eisenach; was a pupil of Schnorr, also studied at Rome under Cornelius, and settled (1868) at Düsseldorf as a professor at the academy. He is chiefly known for his mural decoration—e.g. that of the Goslar Imperial Hall and the staircase of the Weimar Museum. Among his other works are *The Four Seasons*, *Fancy Borne by Dream Gods*, and *Germania Keeping Watch on the Rhine*.

Wislicenus, JOHANNES (1835-1902), German chemist, was born near Querfurt in Thuringia, and in 1865 was appointed professor of chemistry at Zürich; in 1872 succeeded Strecker in Würzburg, and in 1885 Kolbe in Leipzig. His work was almost entirely in the field of organic chemistry, chiefly in connection with the spatial relations of the atoms in the molecule, a theory which his researches did much to establish and develop. He published *Die räumliche Anordnung der Atome in organischen Molekülen* (1887). See Perkin's Memorial Lecture, in *Journal of the Chemical Society* (1905).

Wismar, seapt. tn., Mecklenburg-Schwerin, Germany, at head of bay of same name, 18 m. N. of Schwerin; has shipbuilding and fishing, and manufactures of sail-cloth, tobacco, and paper. It belonged to Sweden (1648-1803), but did not definitely form part of Mecklenburg until 1903, when Sweden renounced her claims to redeem the town, which had been pledged to Mecklenburg for 100

years in 1803. Among many ancient buildings is a 14th-century church. Pop. (1910) 25,453.

Wissembourg. See WISSEN-BURG.

Wissmann, HERMANN VON (1853-1905), German African explorer, born at Frankfort-on-the-Oder; started on a journey of exploration in Africa with Dr. Pogge (1880-2), when he discovered the Sankuru R. In 1883-4 he made a thorough examination of the Congo region on behalf of the Belgian government, reaching Lulua, where he founded the station of Luluaburg (1884). He made a new incursion into equatorial Africa (1886-7), when he explored the sources of the Lomami, Kassai, and other rivers. He quelled a native revolt in German E. Africa (1888), and was governor of the colony (1888-91, 1895-6). He wrote *Im Innern Afrikas* (1888), *Unter Deutscher Flagge quer durch Afrika* (1889), and *Meine Zweite Durchquerung Äquatorial Afrikas* (1891).

Wistaria, a genus of hardy climbing shrubs belonging to the order Leguminosæ. They bear imparipinnate leaves with entire leaflets, and usually racemes of blue flowers, followed by longish pods. They thrive in rich well-drained soil, and make excellent wall or trellis plants. The species most often grown is *W. chinensis*, the Chinese kidney bean tree, of which there are several varieties, but *W. frutescens* and *W. japonica* are equally desirable. The last-named is a white-flowered species.

Witchcraft. In their original sense, the words 'witch' and 'wizard' denoted the possessors of knowledge, or wise people. Much of the witchcraft of Europe was derived from the science of the Magi, or the magicians of ancient Chaldæa and Persia. A notable phase of

this was 'sympathetic' or 'imitative' magic, which, in one particular form, has persisted in Europe to the present day. This consisted in the practice of making a waxen effigy of a person whom it was desired to injure, and when the figure was placed before a fire and the wax began to melt, so the actual body of the person represented was believed to waste away simultaneously. From Chaldæa the custom passed into Egypt, and then into Greece and Rome. But it is more than probable that Chaldæan science was originally something more than mere superstition and trickery. Mr. J. W. Brodie-Innes (*Scottish Witchcraft Trials*, 1891) suggests that hypnotism played an important part in such practices; and the figure may have aided the hypnotist in concentrating his powers. There are cases of the existence of this practice in the Scottish Highlands (the image being a *corp chréidh*, or 'clay body') as recently as the latter part of the 19th century. Sympathetic magic of this kind is practised also in India, Further India, Malaysia, and N. America.

Other aspects of witchcraft are considered in the articles CONJURING, DIVINATION, INCANTATION, and MAGIC. One conclusion to be drawn from a study of its various phases is that, however degraded and contemptible it ultimately became, the science of witchcraft was originally a well-matured system, and that it owed its downfall to the religious factors contained in it. For it is evident that the early Hebrew enactments against witchcraft denoted a struggle between two conflicting sets of ideas. And this struggle was continued in Christian times. When, for example, those people of Ephesus who 'practised curious [or magical] arts brought their books

together and burned them in the sight of all,' as a result of the preaching of the apostle Paul (Acts 19:19), they clearly showed that those books admitted principles which were opposed to the Pauline doctrine. Presumably they recognized the worship of the Evil Principle, otherwise Ahriman, to whom the Magi offered sacrifices. 'Herodotus tells us,' observes Lenormant, 'that the spouse of Xerxes, who was entirely under the influence of the Magi, sacrificed seven children "to the god of darkness and the infernal regions." He also mentions a like sacrifice as having been offered to the same god in the passage of the Strymon, when the Persians were marching into Greece.' Devil worship was always one of the accusations laid against those who practised witchcraft, and a preliminary step in the acquirement of the black art was to sell one's soul to the devil. Pope Innocent VIII., in a bull issued against wizards and witches, accuses them of having intercourse with the infernal fiends. The associates of Doctor Fian, who was burned at Edinburgh in 1591 for sorcery, confessed to having paid homage to the devil.

The histories of the various countries of Europe teem with accounts of the trial and, in most cases, the conviction and execution of people supposed to be sorcerers. Sectarian rancour, private hatred, and political spite were frequently the motives which actuated the accusers. To brand a heretic as a wizard was often the easiest way of disposing of him; and the Puritan settlers of New England evinced the same narrow and relentless spirit as their Roman Catholic congeners in the Old World, with the same disastrous result to those accused of witchcraft. See Scot's *Discovery of Witchcraft* (1584), Wright's *Narratives of Sorcery and Magic*

(1852), Scott's *Letters on Demonology and Witchcraft* (1830), Adams's *Witch, Warlock, and Magician* (1889), Leland's *Gipsy Sorcery* (1891), Sharpe's *History of Witchcraft in Scotland* (1884), and Pitcairn's *Criminal Trials* (1830-3).

Witch-hazel, a term applied to certain shrubs and small trees, one of which is a native of America, the others natives of Japan. From the bark and leaves of the American species an astringent principle is obtained, which is much employed in medicine. This species is often cultivated in gardens as an ornamental shrub. It bears axillary clusters of bright yellow flowers throughout the autumn and winter.

Witch Knots, the crowded clusters of small twiggy branches, like a rook's nest, that sometimes occur on the larger branches of the birch, hornbeam, bullace, and other trees. They are due to the activity of certain fungi of the group of Ascomycetes. Thus *Exoascus Carpinis* causes witch knots on the hornbeam, *E. turgidus* on the birch, and *E. institiæ* on the bullace. Excision is the only successful treatment.

Witenagemôt, the Anglo-Saxon great council. As the small kingdoms of the heptarchic period coalesced under the rule of Wessex, the king of Britain created an assembly of the leading men of the kingdom to whom he might look for counsel. The Witenagemôt was composed of the wise men, the bishops, the ealdormen of the shires, and the king's friends. This body took part in legislation; its consent was necessary to royal grants of land; it exercised judicial powers as a court in the last resort; it gave its consent to taxation imposed by the king; its advice was asked on all questions concerning peace and war, the army, and the fleet. In theory, it had a

consultative voice in all matters of importance; but in practice it had little influence, unless the king desired to be guided by its advice. In theory, the Witenagemôt always elected the kings and could depose them; but as the feudal principle advanced, the king had little to fear from a body which could be swamped by his own personal dependants. Freeman held the view that the Witenagemôt was in reality an assembly of representatives from the shire courts, and that 'every freeman retained in theory the right of appearing in the assembly of the nation.' Stubbs is strongly opposed to this view, and declares that the Witenagemôt was a creation of the 8th century, and was never a body of representatives. See PARLIAMENT; also Stubbs's *The Constitutional History of England*, Freeman's *History of the Norman Conquest*, Gneist's *English Constitutional History* (1886), and M. Hodgkin *passim* in *Political History of England*, vol. i. (1906).

Witham. (1.) Urb. dist. and mrkt. tn., Essex, England, 8 m. E.N.E. of Chelmsford; has a fine old church, and a trade in agricultural produce. Pop. (1911) 3,480. (2.) River, England, rises near Market Overton, in Rutland, and flows N. to Grantham, then N.W. to Long Bennington, where it turns N.E., which direction it follows till it reaches Lincoln. It there turns abruptly S.E., and flows past Bardney, Kirkstead, and Boston to the Wash, 5 m. S.E. of Boston. Length, 80 m.

Wither, GEORGE (1588-1667), English poet, born at Bentworth, Hants. He settled in London about 1610, and in the congenial fellowship of William Browne and Michael Drayton he took to letters. Certain political allusions in his *Abuses Stript and Whipt* (1613) brought him to the Marshalsea in 1613. His

later productions are tediously satiric or tediously pietistic. His poems include *Prince Henry's Obsequies* (1612); *Epithalamia* (1612); *Fidelia* (1617); *Shepherd's Hunting* (1615); *Wither's Motto* (1621); *Faire-Virtue, the Mistress of Philarete* (1622); *Hymns and Songs of the Church* (1623); *Britain's Remembrance* (1628); *Hallelujah* (1641). There are collections (all incomplete) of his *Works* (1620); *Juvenilia* (1622; ed. Brydges, 1814-18; ed. Spenser Society, 1871-82; ed. H. Morley, 1891; ed. F. Sidgwick, with good Life, 1902). See *Poetry of George Wither*, by Bullen (1903).

Withernsea, urb. dist. and seaside resort, E. Riding, Yorkshire, England, 15 m. E. of Hull. The sea is rapidly encroaching on the land at this part of the coast. Pop. (1911) 2,279.

Withington, par. and tn., Lancashire, England, 4 m. S. of Manchester, of which it is a residential suburb.

Withnell, urb. dist., Lancashire, England, 4 m. S.W. of Blackburn; has cotton mills and bleach works. Pop. (1911) 3,400.

Witkowitz, tn., Austria, in extreme N.E. of Moravia, 23 m. S. of Ratibor (Prussian Silesia); with coal mines and iron works. Pop. (1911) 22,040.

Witness. See EVIDENCE.

Witney, mrkt. tn., England, co. of and 11 m. W. by N. of Oxford; with manufacture of blankets and gloves. Pop. (1911) 3,529.

Witt, DE. See DE WITT.

Witte, KARL (1800-83), German jurist and Italian scholar, born at Lochnau, near Halle, was a prodigy of learning as a boy. He was sent by the king of Prussia to Italy to examine the museums and libraries, and on his return was appointed to the chair of law at Breslau (1823), which he exchanged for a similar chair at Halle (1834). Among his works

are *Das Preussische Intestaterbrecht* (1838), a translation of *The Decameron* (1843), and of Dante's lyrical poems (1842-3), a critical edition of the *Divina Commedia* (1862), and a translation of the same (1865), and other Dante works.

Witte, COUNT SERGIUS JULIEVITCH DE (1849), Russian statesman, was born at Tiflis. During the Russo-Turkish war of 1877-8 he was director of the South-Western Rys. In 1888 he became director of the railway department at the Ministry of Finance, in 1892 minister of communications, in 1893 minister of finance, and in 1903 was made president of the committee of ministers. He was the chief Russian plenipotentiary in the peace negotiations with Japan (1905), and for a short time after his return was the principal minister of the Czar, but resigned in May 1906 through differences with the emperor. He has published *Principles of Railway Tariffs* (1884).

Witten, urban dist., Prussia, in Westphalia, 8 m. s.w. of Dortmund; has iron and steel foundries, railway machine shops, and glass works. Pop. (1910) 37,437.

Wittenberg, tn., prov. Saxony, Prussia, on r. bk. of Elbe, 55 m. by rail s.w. of Berlin; has manufactures of cloth, hosiery, leather, beer, and machinery. It was the 'cradle of the reformation.' Luther was a professor in the university. The castle church (restored in 1892) contains the tombs of Luther, Melancthon, Frederick the Wise, and John the Steadfast, and on its old doors (now replaced) Luther, in 1517, nailed his ninety-five theses against indulgences; his house is still preserved; the spot (outside the Elster Gate) where he burned the papal bull is pointed out; his statue, in bronze, by Schadow, stands in the marketplace. The university was in-

corporated with that of Halle in 1815. Pop. (1910) 22,411.

Wittenberge, tn., Prussia, in Brandenburg, 75 m. n.w. of Berlin; has railway machine shops, and manufactures textiles. Pop. (1910) 20,607.

Wittgensdorf, vil., Saxony, Germany, in circle and 6 m. n.w. of Chemnitz. Pop. (1910) 6,259.

Wittingau, tn., Bohemia, Austria, 15 m. e. by N. of Budweis. The castle of Prince Schwarzenberg is here, and has a rich collection of archives. Pop. (1911) 5,278.

Wittlich, tn., Rhenish Prussia, 19 m. n.n.e. of Trèves. Pop. (1910) 5,885.

Wittstock, tn., Brandenburg, Prussia, 60 m. n.w. of Berlin. It has an old town hall, some interesting churches, and remains of its old walls. Textiles are manufactured. Pop. (1910) 7,606.

Witu, or VITU, a sultanate in the Tanaland prov. of the British protectorate of E. Africa, extending along the Indian Ocean and enclosed by the Lamu district. Area, 1,200 sq. m. Pop. 15,000. Capital, Witu (pop. 6,000). A large part of the sultanate is covered with rubber-producing and other forests. It is mainly inhabited by Swahilis, descendants of runaway slaves and outlaws.

Witwatersrand. See RAND.

Wiveliscombe, urban dist. and markt. tn., Somersetshire, England, 10 m. w. by N. of Taunton. The town is an agricultural centre, and there are slate quarries. Pop. (1911) 1,316.

Wivenhoe, urban dist. and tn., Essex, England, on the Colne. The principal industry is ship and yacht building. There is a trade in oysters. Pop. (1911) 2,376.

Wladimir. See RUSSIA.

Wlislöcki, HEINRICH VON (1856), Hungarian writer, born at Kronstadt, Transylvania, is the author of many works on the

customs, folklore, and language of the Hungarian gypsies—*e.g.* *Märchen und Sagen der transsilvanischen Zigeuner* (1886); *Vom wandernden Zigeunervolk* (1890); *Aus dem innern Leben der Zigeuner* (1892); and *Volks Glaube und religiöser Brauch der Zigeuner* (1892).

Wloclawec, tn., Warsaw gov., Russian Poland, 88 m. w.n.w. of Warsaw city, on the Vistula; is an episcopal see and a river-port, with grain trade, breweries, iron works, pottery, and chicory factories. Pop. 23,000.

Woad, a product obtained by the partial fermentation of the leaves of the woad plant (*Isatis tinctoria*). It contains about two per cent. of indigo, and was formerly used as a dye itself, but is now mainly employed to set up the reductive fermentation utilized in dyeing by means of indigo. The plant is still cultivated on a small scale near Boston in Lincolnshire, there being a small factory at Algarkirk.

Woburn. (1.) Market tn., Bedfordshire, England, 11 m. n.w. of Luton. Pop. 1,200. Woburn Abbey, the principal seat of the Duke of Bedford, occupies the site of a Cistercian abbey, founded in 1145 by monks from the abbey of Fountains in Yorkshire. The last abbot, Robert Hobbs, was, according to tradition, hanged on an oak in the park in 1538. In 1547 the lands were granted to John, Lord Russell, afterwards Earl of Bedford. The present mansion, which was erected in the 18th century, contains a magnificent collection of portraits and other works of art. The pleasure-grounds and gardens were famous in the early years of the 19th century. (2.) City, Middlesex co., Massachusetts, U.S.A., 10 m. n.n.w. of Boston; with manufacture of boots and shoes, chemicals, and glue. Pop. (1910) 15,303.

Wodehouse, JOHN. See KIMBERLEY, EARL OF.

Woden. See ODIN.

Wodrow, ROBERT (1679-1734), Scottish ecclesiastical historian, was born in Glasgow, and in 1704 appointed minister of Eastwood in Renfrewshire, where he remained the rest of his life. He was noted as a preacher, and took an active part in the ecclesiastical politics of his day, his sympathies being with the Evangelical and anti-Patronage party. In 1721-2 appeared his chief work, *The History of the Sufferings of the Church of Scotland from the Restoration to the Revolution*, a sympathetic account of the Covenanters. He left much material in MSS., including *Lives of the Scottish Reformers* (1834-45, by Maitland Club), *Analecta* (1842-3, Maitland Club), some of his *Correspondence* (1842-43; Wodrow Society), and *Biographical Collections Relating to the North-East of Scotland* (1890, New Spalding Club).

Woensel, comm., Netherlands, in N. Brabant, 18 m. s.s.e. of 's Hertogenbosch. Pop. (1910) 8,818.

Woerden, comm., Netherlands, in S. Holland, 10 m. w. of Utrecht. Pop. (1910) 5,754.

Woermann, KARL (1844), German art historian and poet, born in Hamburg. After some years of travel he was appointed professor of art and literature at Düsseldorf (1874), and in 1882 became director of the picture gallery at Dresden. His writings include *Kunst- und Natur-skizzen aus Nord- und Süd-Europa* (1880), *Was uns die Kunstgeschichte lehrt* (new ed. 1894); *Geschichte der Kunst aller Zeiten und Völker* (1900, etc.); and, with Woltmann, a *Geschichte der Malerei* (1878). Among his poetical works are *Neue Gedichte* (1884), *Zu Zweien im Süden* (1893), and *Deutsche Herzen* (1896).

Woffington, PEG (c. 1720-60), Irish actress, was born at Dublin. She appeared in England first at Covent Garden, in 1740, and her beauty and grace took London by storm. Garrick himself was supposed to be seriously attached to her. She atoned for moral faults by a warm heart and sincere charity. She left the stage on May 3, 1757, after a breakdown in the part of Rosalind. She founded almshouses at Teddington. See *Lives* by Daly (1884) and Molloy (1888), and Charles Reade's novel *Peg Woffington*.

Woguls, or VOGULS, branch of the Ugrian Finns, closely allied to the West Siberian Ostiaks. They occupy principally the eastern slopes of the Ural range. Since 1722 they have been nominal Christians, but are still Shamanists at heart. Pop. from 20,000 to 30,000.

Wohlau, tn., Prussian Silesia, 23 m. n.w. of Breslau. Pop. (1910), 5,814.

Wöhler, FRIEDRICH (1800-82), German chemist, was born near Frankfort-on-Main. Influenced by Gmelin, he gave up medicine for chemistry, and then studied with Berzelius. In 1825 he was appointed teacher of chemistry in the Berlin technical school, proceeding in 1831 to a similar post at Kassel, where he remained till 1836, when he was chosen professor of chemistry in Göttingen—a chair he retained for the rest of his life. The most far-reaching of Wöhler's many researches was that on cyanic acid, in which he discovered that it was possible to prepare, by laboratory methods from inorganic materials, products that it was previously thought could only be formed in living organisms. At the same time he discovered the phenomenon of isomerism, a principle that has led to most fruitful results. Wöhler was also the first to prepare aluminium and boron,

and to discover along with Liebig the classes of compounds known as glucosides and enzymes. He published *Grundriss der unorganischen Chemie* (1831), *Grundriss der organischen Chemie* (1832), and *Praktische Übungen in der chemischen Analyse* (1854). See Hofmann's *Zur Erinnerung an F. Wöhler* (1883).

Woking, tn. and health resort, Surrey, England, on the Wey and the Basingstoke canal, 6 m. N. of Guildford. In the district are an Oriental Institute and Moham-medan mosque, boys' industrial school, home for disabled soldiers and sailors, barracks occupying former convict prisons, and a lunatic asylum. Woking or Brook-wood cemetery (500 acres), with crematorium, lies $3\frac{1}{2}$ m. W. Pop. (1911) 24,810.

Wokingham, or OKINGHAM, munic. bor. and mrkt. tn., Berkshire, England, 7 m. E.S.E. of Reading. The parish church is an ancient building, and there are almshouses founded in 1451. New almshouses were erected in commemoration of Queen Victoria's jubilee. The town hall and public offices and county police station are modern. Wokingham was anciently known as 'chief town of Windsor Forest,' and was for several centuries the civil centre of that district. Wokingham is the last place in the country where bull-baiting was practised, about 1840. Pop. (1911) 4,352.

Wolcot, JOHN, or PETER PINDAR (1738-1819), English pamphleteer, was born at Dodbrooke in Devonshire. He went to Jamaica as personal physician to Sir William Trelawny. On his return to England he settled in Cornwall, at Truro and Helstone, until 1779, when he took up his residence in London. There he quickly became famous for his satires, characterized by pungent and racy humour, of which *The Lousiad* may be taken as an example.

Wolf (*Canis lupus*), the largest living member of the family Canidæ, with the exception of some domesticated dogs. The common wolf is found over the whole of the northern hemisphere, but is absent from Africa and S. America, though the Falkland Is. have a wolf of their own. In Europe it reaches a length of about three and a half feet, exclusive of the tail, which is less than half as long. The colour is generally rufous or yellowish gray above, with some black, and the under surface is whitish. The under fur is woolly and of a slaty-brown colour. The wolf has long legs, a lank body, erect ears, and a long bushy tail, which hangs downwards between the haunches, and is not curled up towards the tip. In N. America it has less red in its coloration than the average European form. Wolves are usually nocturnal in their habits, spending the day in the den, which may be a cave, a hollow tree, or even a burrow. Contrary to the common belief, wolves are for much of the year solitary or found in pairs; but at certain seasons, especially in winter, they live together in packs, and combine to bring down their prey. Such packs are exceedingly destructive, sometimes killing large numbers of sheep or deer, and leaving the carcasses almost untouched. Almost any kind of animal food, fresh or in state of carrion, is acceptable, while when hard pressed it is said that the animals will eat frogs and even vegetable food. Birds are constantly eaten. The intelligence and power of learning by experience is great: wolves which live in a region where they are much persecuted show extraordinary cunning in avoiding traps. The young are born in the spring, and number from six to ten in a litter. They usually remain with their parents till the end of the

year. The natural cry is a loud and continuous howl, but wolves kept in captivity soon learn to bark like dogs. When taken young the wolf may be readily tamed. The animals were formerly abundant throughout the British Isles. According to Harting, the wolf in England became extinct in the reign of Henry VII., in Scotland in 1742, and in Ireland about 1770.

The wolf of India has been made a separate species as *C. pallipes*, on account of the smaller size, slighter build, shorter fur, and the absence of under fur. It is confined to India south of the Himalaya, is found only in small packs, and is rather silent. This wolf in certain parts of India still takes a yearly toll of children's lives, while there are many stories of children being brought up by wolves, none of which have been authenticated, though the tradition seems almost world-wide. Another wolf is *C. antarcticus* of the Falkland Is., now stated to be extinct. This wolf is or was silent, not gregarious, and largely diurnal in habits. For the prairie wolf see COYOTE. See Mivart's *Dogs, Jackals, Wolves, and Foxes* (1890), and Harting's *British Animals Extinct within Historic Times* (1880).

Wolf, FERDINAND (1796-1866), Austrian literary historian, was born at Vienna, and entered the imperial library at Vienna as *scriptor* in 1819, becoming later *custos*. When the Viennese Academy of Sciences was founded, in 1847, he was made member and secretary. Between 1833 and the date of his death Wolf wrote incessantly—mostly on Spanish, Portuguese, Brazilian, and Old French literature; and he illuminated everything he touched. His most important papers were collected in book form (the latest volume was edited by Stengel in

1890). In 1859 he founded, with Ebert, the *Jahrb. für rom. und engl. Lit.* The notes he wrote for Julius's translation of Ticknor's *Spanish Literature* (1852; supplement edited by his son, Adolf, 1867) were incorporated in the later English editions.

Wolf, FRIEDRICH AUGUST (1759-1824), German scholar, originator of the Homeric question, was born near Nordhausen, and was a schoolmaster from 1779 to 1783; his edition of Plato's *Symposium* then won him a professorship at Halle (1783). There he founded the science of philology. In 1789 he published an edition of the *Leptines* of Demosthenes, and in 1795 his *Prolegomena* to Homer. In this work he denied that the poems of Homer could have been originally produced in their present form, mainly because (1) writing was unknown; (2) there was no public to which such a long work could appeal; and (3) Pisi-stratus was said to have arranged the scattered works of Homer. In fact, he believed that the Homeric poems were originally short ballads, only united into a continuous epic in the 6th century B.C. (See HOMER.) His career at Halle was ended in 1807 by the French invasion; the rest of his life was spent at Berlin. For some time he was employed in the department of education; then again he held a professorship. His most finished work is the *Darstellung der Altertums-wissenschaft* (1833). See *Life*, in German, by Körte (1833), and by Varnhagen von Ense (1875).

Wolf, or WOLFF, JOHANN CHRISTIAN VON (1679-1754), German philosopher, born at Breslau, became (1707) professor of philosophy at Halle. Driven from there in 1723 by religious opposition, he obtained a chair at Marburg, but was recalled to Halle by Frederick the Great in 1740. Although Wolf's philosophy was

very influential in the 18th century, it had no originality or depth. His leading ideas were taken from Leibniz, but they lost much of their profounder philosophical import in the process of popularization. See *C. Wolff's eigne Lebensbeschreibung* (1841), ed. Wuttke.

Wolfe, CHARLES (1791-1823), author of *The Burial of Sir John Moore* (1817), was born at Blackhall, Co. Kildare, Ireland, and became curate of Ballyclog, then rector of Donoughmore. His literary *Remains* were published in 1825, with *Life*.

Wolfe, JAMES (1727-59), British general, was born at Westerham, Kent. He first distinguished himself at the battle of Dettingen (1743). He gained still further distinction at the battles of Culloden in Scotland (1746) and of Lawfeld in Belgium (1747). Pitt appointed Wolfe to lead the land expedition against Quebec. His little army, on the night between the 12th and 13th September 1759, having descended the St. Lawrence in boats and stealthily scaled the Heights of Abraham, was discovered at dawn by the astounded French commander, Montcalm, drawn up in battle array before Quebec. The fighting was of a desperate character. Wolfe himself was mortally wounded, but the capture of Quebec wrested Canada from France. See R. Wright's *Life and Correspondence of Major-general James Wolfe* (1864), Parkman's *Montcalm and Wolfe* (1885), Abbé Casgrain's *Wolfe and Montcalm, Makers of Canada Series* (1906), E. Salmon's *Life* (1909), and Willson's *Life and Letters of James Wolfe* (1909).

Wolfenbüttel, anc. tn., Brunswick, Prussia, on the Oker, 7 m. by rail s. of Brunswick; has manufactures of machinery and copper goods, cloth, preserves, and leather. Lessing was libra-

rian (1770-81) in the ducal library, rebuilt in 1887. An old castle with a tower, a theatre, and the house in which Lessing wrote *Nathan der Weise*, now a museum, are the prominent buildings. One of the old churches contains the tombs of some of the princes of Brunswick. Pop. (1910) 18,933.

Wolff, SIR HENRY DRUMMOND (1830-1908), English diplomatist, entered the Foreign Office in 1846. After diplomatic service abroad he entered Parliament for Christchurch (1874-80) and Portsmouth (1880-5), and for a time was one of the 'Fourth Party.' From 1892 to 1900 he was ambassador at Madrid. He was made a privy councillor in 1885. He published *The Mother Country and the Colonies* (1869), a translation of Lesseps's *History of the Suez Canal* (1876), *Some Notes of the Past* (1893), and *Random Recollections* (1908).

Wolff, JOSEPH (1795-1862), missionary, father of preceding, was the son of a Jewish rabbi, and was born near Bamberg. He came to England (1821), and became a Protestant. He was sent out to the East as a missionary, and began a nomadic career over south-western Asia, records of which he published in *Mission to Bokhara* (1845) and *Travels and Adventures* (1860). He returned to England in 1844, and settled as a vicar in Somersetshire.

Wolff, KASPAR FRIEDRICH (1733-94), German anatomist and physiologist, born at Berlin, and was called (1766) to St. Petersburg to fill the chair of anatomy and physiology in the university. He wrote works on *Generation* (1759), *The Formation of the Intestinal Canal* (1768), and *Memoirs on the Structure of the Heart*.

Wolffian Bodies, or **MESONEPHROS**, are fetal structures which excrete urea before the forma-

tion of the permanent kidneys. After the permanent kidneys are developed, the greater part of the Wolffian body disappears; but a portion shares in the formation of the generative organs—the ovaries in the female, and the testicle in the male.

Wolf-fish, or **SEA-WOLF** (*Anarrhichas lupus*), a large fish belonging to the blenny family. It is abundant off parts of the Scottish coast. It may reach a length of six feet, and receives its popular names from the great development of the teeth. Some are conical like the canines of a wolf, some tuberculated, some flattened and pavement-like. The food consists of molluscs and crustaceans. In general appearance the fish resembles the other blennies, except in size. Its appearance and the peculiar smell prevent it from being sent to market in Britain. In Greenland and Iceland it is, however, like its near allies, an important article of food.

Wolf-hound. See BORZOI.

Wolfram. See TUNGSTEN.

Wolfram von Eschenbach (early 13th century), the most famous of the German minnesingers, was one of the poets welcomed by the Landgrave Hermann of Thuringia at the Wartburg. *Parzival*, his principal poem, falls within the opening years of the century, and the *Willehalm*, which he left unfinished, in 1216. The date of his shorter works, the *Titarel* fragments and the *Tag* (or *Wächter*) *Lieder*, is uncertain. The birth and burial place of the poet has been identified with Obereschenbach in Franconia. The *Parzival*, a version of the Perceval grail quest, is not only the finest of the Grail romances, but is the most individual and characteristic work of mediæval literature previous to Dante. In this poem the Grail is a stone.

The swan-knight, Lohengrin, is Parzival's son, the grail-bearer becomes the mother of Prester John, and the whole poem bristles with allusions to Oriental philosophy and legend. Wolfram states that the source he followed was a poem by one Kiot, the Provençal. Wolfram's works show great depth of thought and extreme beauty of conception, while the moral and spiritual teaching is throughout far in advance of his age, and indeed curiously in harmony with modern ideals. In the poem of the *Wartburgkrieg* Wolfram von Eschenbach is represented as contending with the heathen magician Klingsor. Richard Wagner has introduced Wolfram as a leading character in *Tannhäuser*, and based his *Parzifal* upon Wolfram's masterpiece.

See *Wolfram von Eschenbach's Parzival und Titirel*, ed. by E. Martin (1900-3)—text and exhaustive commentary; *Wolfram von Eschenbach*, ed. Lachmann (5th ed. 1891, being the standard text); *Parzival und Titirel*, ed. Bartsch (1875-7), in *Deutsche Classiker des Mittelalters*, vols. ix.-xi.—this edition contains notes and glossary, Lachmann's does not; *Parzival und Titirel*, ed. Karl Simrock (1883)—a modern German rendering, very close to original text; *Parzival*, by W. Hertz (1898)—modern German, more poetical than Simrock, but less faithful; *Parzival*, by J. L. Weston (1894)—English verse translation; *Der Gral*, by Paul Hagen (1900)—a discussion of the nature of the Grail stone, and examination of the Oriental references—and his *Wolfram und Kist* (1906); *Das Hohelied vom Rittertum*, by G. Bötticher (1886)—on the ethical teaching of the poem; *Legends of the Wagner Drama*, by J. L. Weston (1896).

Wolfsbane. See ACONITE.

Wolf-spider, a name for the tarantula. See SPIDER.

Wolgast, seapt. in Pomerania, Prussia, 32 m. E.S.E. of Stralsund. It manufactures steel, chemicals, alcohol, and tobacco. Pop. (1910) 8,209.

Wollaston, WILLIAM HYDE (1766-1828), English chemist and physicist, was born at E. Dereham, Norfolk, and appointed fellow of Caius College, Cambridge, in 1787. He commenced the practice of medicine at Bury St. Edmund's in 1789, and in London in 1797, but retired from the profession in 1800 to devote himself to scientific research. Amongst his important discoveries were those in connection with the platinum metals, including palladium and rhodium, of which the method of making platinum malleable brought him a considerable fortune. He also made investigations in connection with Dalton's atomic theory, considerable advances in optics, inventing methods of determining the refractive power of materials, the camera lucida, the reflecting goniometer, and improvements in lenses and prisms; whilst he did much to establish the truth of the wave theory of light. His papers were published in the *Philosophical Transactions* (1809-39). He was secretary of the Royal Society from 1806, and a commissioner of the Royal Society on the Board of Longitude. He founded the Wollaston medal of the Geological Society, and the donation fund of the Royal Society.

Wollin, isl. in Pomerania, Prussia, on the N. side of the Great Haff, opposite the mouth of the Oder. It contains the town of Wollin—pop. (1910) 4,541—and the watering-place of Misdroy (pop. 2,088).

Wollongong, seapt. tn., co. Camden, New South Wales, 49 m. S. of Sydney. Pop. 3,600.

Wolsingham, par. and tn., Durham, England, on the riv. Wear, 10 m. w.n.w. of Bishop Auckland. Woollen cloths and agricultural implements are manufactured, black-spotted marble is quarried, and there is much business in connection with the coal, iron, lead, and limestone works in the neighbourhood. Pop. reg. dist. (1911) 7,602.

Wolstanton United, urban dist., Staffordshire, England, adjoining Stoke-on-Trent on the N.E. Pop. (1911) 27,341.

Wollstonecraft, MARY. See GODWIN.

Wolseley, GARNET JOSEPH WOLSELEY, VISCOUNT (1833), British field-marshal, was born in Co. Dublin. His first experience of active service was in the second Burmese war (1852-3), when he was severely wounded while leading a storming party against a Burmese stronghold. In the Crimea he served in the trenches until Sebastopol was taken, and was again severely wounded (Aug. 30, 1855). In India (1857-9), during the mutiny, he shared in the siege and capture of Lucknow, and took part in all the engagements fought by the force under General Sir Hope Grant. After further experience in the Chinese war (1860), he, in 1870, commanded the Red River expedition in Canada against the rebel Louis Riel. Four years later he commanded the expedition against the king of Ashanti (King Coffee). In S. Africa Wolseley completed the subjugation of the Zulus, conquered Sekukuni's hostile nation, subdued the disaffected Boers, and completed the annexation of the Transvaal. In 1882 he crushed in Egypt the revolt of Arabi Pasha in the decisive battle of Tell-el-Kebir. For this he was raised to the peerage as Baron Wolseley. Lord Wolseley's last active undertaking was the gallant but unavailing effort to

relieve General Gordon at Khartum (1884-5). For this he was created (1885) Viscount Wolseley. He was raised to the rank of field-marshal in 1894, and on the retirement of the Duke of Cambridge became commander-in-chief of the army (1895-1900). His publications include *The Soldier's Pocket-book for Field Service* (5th ed. 1886), *Life of the Duke of Marlborough* (1894), *The Decline and Fall of Napoleon* (1895), and *The Story of a Soldier's Life* (1903). See *Memoir*, by Low (1878).

Wolsey, THOMAS (1471-1530), English statesman, was born at Ipswich. He became a fellow of Magdalen College, and remained in Oxford till 1500, when he took the living of Lymington in Somerset, and in 1501 was made chaplain to Archbishop Deane at Canterbury. Henry VII. employed him on several diplomatic missions, and made him dean of Lincoln. On Henry VIII.'s accession, Wolsey was appointed a member of the king's council, and almoner in 1511. He had already received the bishopric of Tournai, and was now made (1514) bishop of Lincoln, and a little later archbishop of York. His rapid rise was due to his skill in diplomacy and foreign policy. He was an advocate of the balance of power, and during the early years between the Emperor Charles V. and Francis I. of France he endeavoured to prevent either king from obtaining an undue advantage. In 1515 Wolsey succeeded Warham as lord chancellor, and in 1518 was created cardinal-legate by Pope Leo X. Wolsey now endeavoured to secure for his country the position of arbiter between Francis and Charles. In June 1520 Henry VIII. met Francis at the 'Field of the Cloth of Gold,' and shortly afterwards he met Charles at Gravelines. In the inevitable

war, which broke out in 1521, England sided with Charles. Wolsey hoped by the aid of the emperor to secure the papacy. The invasions of France in 1522 and 1523 by the English proved failures, and the friendship between England and the emperor cooled. Charles v.'s victory at Pavia (1525) alienated the English, and was followed by an alliance between England and France (1527). Wolsey had been disappointed in his hopes of the papacy. During these years the cardinal had shown his zeal for reform and for learning by his foundation of Cardinal (afterwards Christ Church) College, Oxford, and of a college at Ipswich. His further designs were, however, checked by the divorce question. Henry wished to divorce Catherine of Aragon, and Wolsey endeavoured to induce the papacy to declare the king's marriage invalid. But Clement VII. was in the power of Charles v., the nephew of Catherine, and Wolsey failed (1529). Henry thereupon deprived him of his chancellorship, accused him of having broken the Statute of Præmunire, and forced him to retire to his diocese of York. Summoned to London, Wolsey died on his way at Leicester Abbey. See Creighton's *Cardinal Wolsey* (1888), and Cavendish's *Life of Wolsey* (new ed. 1885).

Woltmann, ALFRED (1841-80), German historian, born at Charlottenburg; was successively professor of art history at Karlsruhe (1868), Prague (1874), and Strassburg (1878). His works include *Holbein und seine Zeit* (2nd ed. 1874-6), *Die Deutsche Kunst und die Reformation* (2nd ed. 1871), *Aus vier Jahrhunderten Niederländisch - Deutscher Kunstgeschichte* (1878); and with Woermann, *A Geschichte der Malerei* (1878).

Wolverene. See GLUTTON.

Wolverhampton, munic., parl., and co. bor., Staffordshire, England, 13 m. N.W. of Birmingham. The church of St. Peter is chiefly 13th-15th century, but of much older foundation. Public buildings include town hall, agricultural hall, municipal art gallery and museum, and technical schools and laboratories (chemical and metallurgical). The town is a great centre of the iron industry; motor cars and cycles, and japanned, zinc, and tin wares are also made. The manufacture of electrical machinery and plant is an important industry. Coal and iron are mined. Pop. (1911) 95,333.

Wolverhampton, SIR HENRY HARTLEY FOWLER, VISCOUNT (1830-1911), English statesman, born at Sunderland; entered Parliament in 1880 as member for Wolverhampton, which constituency he represented until he was made a viscount in 1908. As Mr. Fowler he was under-secretary for the home department in Mr. Gladstone's government (1884-5), and then financial secretary to the Treasury during the last months of the administration (1885-6). On the return of the Liberal party in 1892 he was made President of the Local Government Board, with a seat in the cabinet. In that capacity he carried through the Parish Councils Bill (1893-4). When Mr. Gladstone retired from public life, the Earl of Rosebery (who became Premier) transferred Mr. Fowler to the India Office as Secretary of State, and on his retirement in 1895 he received a.g.c.s.i. He was Chancellor of the Duchy of Lancaster (1905-8) and Lord President of the Council (1908-10).

Wolverton, par. and tn., Buckinghamshire, England, 10 m. N.E. of Buckingham. Here are carriage works of the London and North-Western Ry., and there are also printing works. Stony

Stratford, on the Ouse, and Wolverton are practically one town. Combined pop. (1911) 10,427.

Womb. See UTERUS.

Wombat (*Phascolomys*), a genus of herbivorous marsupials, with three living species, all confined to Australia and Tasmania. The largest species measure thirty inches from the tip of the snout to the root of the tail; and all have massive, clumsy bodies and short, thick legs. The head is broad and flat, the tail a mere stump, and there are five toes on each foot. With the exception of the first digit of the hind foot, all the toes are furnished with powerful claws, by means of which the animals are capable of excavating burrows. In these burrows or in rock-clefts the day is passed, while at night the animals roam about in search of grass, roots, and other kinds of vegetable food. All the teeth are rootless, and the incisors especially show a strong resemblance to those of rodents. The common wombat, the largest species, is *P. Mitchellii*, and is confined to the Australian continent, while *P. ursinus* occurs in Tasmania and the neighbouring islands. The third species, *P. latifrons*, is South Australian.

Wombwell, urban dist., W. Riding, Yorkshire, England, 4 m. S.E. of Barnsley; has coal mines, brickyards, and clay works. Pop. (1911) 17,538.

Women. Biological Aspect.—Fundamentally, the question of the position of women is a biological question. The greater energy of the male amongst most species, and the structural characteristics which render maternity so much more serious a function than paternity, constitute the most decisive factor in determining the position of women. The consideration that maternity by no means involves the whole life of a woman, and the further consideration that not all women are

or need be child-bearers, limit but do not change the decisive nature of this factor. A further biological fact of the first importance is the nature of hereditary transmission. The non-sexual characters and aptitudes of both parents are equally liable to be transmitted to the children of either sex, however modified their subsequent development may be by the presence of the sexual characters. If, therefore, one sex reveals many defective and incapacitating qualities, it is necessary to admit the possibility of their presence also in the other sex, which may equally inherit them; while, if one sex displays a marked superiority, that superiority is necessarily also transmissible to the other sex. From the biological standpoint, therefore, we must rule out of court any extreme statement regarding the position of women: men and women are alike members of the same species, and must stand or fall together.

Position of Women in Savagery.

—It used to be commonly believed that the position of women among most savage races is one of extreme and unmitigated oppression, and that they are constantly subjected to cruelty and violence by men. Such a view was emphasized by Letourneau, and traces of it may be found in many other writers. The more precise investigations of recent anthropologists have shown that this belief is, in the main, unfounded. It is quite true that under savage conditions the work of women is very frequently heavy and constant, their youthfulness being in consequence lost at a very early age. But this is due not to the cruelty or oppression of the male sex, but to the natural biological fact that, owing to the maternal functions of women, the duties of civilization under primitive conditions inevitably

press more urgently on women than on men. Women must work more because at the period when labour has not become specialized women are practically the leaders of civilization; agriculture and all the chief conditions are mainly in their hands.

We may probably see a fairly typical, though not specially favourable, example of the position of women among savages in the Papuans, who have been studied more carefully and scientifically than other primitive peoples owing to the labours of the Cambridge anthropological expedition to Torres Strait. Among these Papuans the husband had complete control over his wife: she was his property, for he had paid for her; under some circumstances he might even kill her. But although the position of women was here, we may say legally, so inferior to that of the men, their actual position was not unfavourable. They 'had a good deal to say on most questions,' Haddon remarks, 'and were by no means downtrodden or ill-used.' Moreover, they invariably took the initiative in courtship, and a man could not obtain a wife unless a woman made him an offer of marriage. Such an example is instructive, as showing that even when as a wife she is the property of her husband, the savage woman may yet in some respects enjoy an independence unknown even to her most civilized sisters. One source of the belief in the cruelty exercised by men towards women among primitive peoples is undoubtedly the misinterpretation of certain courtship customs which are of world-wide extension—e.g. the belief that 'marriage by capture' was formerly universal. See *MARRIAGE—Marriage by Capture*.

The Matriarchate.—While there has thus been a widespread

belief, which we can now see to be very much exaggerated, in the inferiority and oppression of primitive women, another stream of opinion has gone to the opposite extreme by setting up the theory of a primitive supremacy of women. In 1861 Bachofen published his book *Das Mutterrecht*, in which the arguments for this primitive gynecocracy and matriarchate were first set forth, and he was followed by M'Lennan and other investigators. These arguments rest on the belief that in emerging from a supposed early state of promiscuity the fact of maternity must be recognized earlier than that of paternity, as well as the undoubted fact that among some primitive peoples descent in the female line has clearly prevailed. It must, however, be borne in mind that we have no authenticated direct picture of any community, ancient or modern, in which this gynecocracy has clearly or definitely prevailed. Moreover, descent in the female line, where it prevails, although it undoubtedly tends to give women a position of consideration, by no means necessarily confers any position of superiority. Matriarchy is not strictly analogous to the patriarchal constitution of a community; and while it has possibly influenced the position of women, and given rise to many isolated examples of feminine authority and influence, it is very doubtful whether it has ever prevailed as a definite and consistent system.

When the peoples of the West first appear before us in early historical times, the constitution of society is nearly everywhere mainly patriarchal. Fustel de Coulanges, in *La Cité Antique* (16th ed. 1898), has painted a clear picture of this state of things as it existed in early Greece and Rome. With the

development of civilization the supreme authority of the *paterfamilias* became practically restricted; but in more subtle ways it received sanction in law, and with constant limiting modifications this legal tendency has been maintained in Europe to the present time.

The Influence of Christianity.—According to some, Christianity has raised the position of women; according to others, it has degraded it. In reality Christianity has in this matter exerted an influence in two opposing directions. As the religion of the oppressed, the gospel of suffering and pity, Christianity specially appealed to women, and sanctified some of the most typically feminine emotions. But, on the other hand, as a religion which at an early period of its history became strongly infused with ascetic ideals, Christianity was actively hostile to women, since it regarded them as the peculiar representatives of sexuality. Christianity glorified woman the virgin, and was practically lenient to woman the sinner; but although it opened careers for women in its cloisters, still, under the influence of the Pauline writings, it refused to them any open and conspicuous part in the conduct of public worship. While, therefore, Christianity has offered many advantages to women, these advantages have always been strictly limited and partial. The religions of classic antiquity had at many points given to women a position of more unqualified honour, while the general position of women was never lower than in the late middle ages, when the influence of Christianity was supreme.

The Renaissance.—The renaissance, which served to liberate, or at all events to impart dignity to, so many of the human activities which Christianity had thrust into the background,

ignored the pale and youthful virgin, and occupied itself with the mature and robust woman. As against the somewhat narrow and ascetic Christian ideal of woman, it set up a more broadly human ideal, which was first minutely described in literature by Boccaccio, and, after a considerable interval, first represented on canvas by Titian. The renaissance was much occupied with questions of beauty, and it fully recognized, sometimes even accentuating, the sexuality of women, while at the same time encouraging them in a devotion to intellectual pursuits. The literature of this period devoted to the glorification of women is very copious, but it is mainly æsthetic and frequently extravagant, so that it was not adapted to exert any influence on life generally.

Rise of Modern Movements of Emancipation.—It was in 17th-century France that the seeds of the modern growths of women's influence may be said to have been sown. At that time women began to assert themselves very prominently and independently in literature, setting forth various characteristically feminine ideas which were then new in the world, and at the same time beginning to assert a deliberate and conscious social influence on language and manners which was also new. By the early years of the 18th century this influence had become clearly affirmed, and in many respects recognized and accepted by men; it is noteworthy that men began to write, not merely for women, but in the manner of women, as in Marivaux's *Marianne*. At this period the growing influence of women showed itself in two parallel lines. Along one line women had acquired an unquestioned social supremacy; along another line the growth of more or less scientific social speculation had led to the development

of what were subsequently called 'women's rights,' although it was not till later that these began to take practical shape. The Vicomte de Ségur, in a work on women which embodies the 18th-century French conceptions (though not published till the early part of the 19th century), writes from a standpoint which is exactly that of to-day. The finer ideals of the century were, however, becoming coarsened some time before the revolution broke out, and the centre of the movements for raising the position of women was transferred to England. The transition was marked by the publication in 1792 of Mary Wollstonecraft's *Vindication of the Rights of Women*, a work which in its inspiration was largely French, but in its tone and tendency thoroughly English. From that time onwards England, and a little later America, have taken the foremost place in all movements for rendering the position of women as nearly as possible one of social equality with that of men. But such a movement is in any case inevitable with the development of civilization. The ancient and matured civilization of the Egyptians was very favourable to women, and the shorter but more rapid development of Rome constantly tended to improve their position. In the same way the legal enactments and decisions which have in England improved the condition of women began centuries before the existence of any propaganda for women's rights. The main tendency of civilization is in the direction of an ever greater freedom and scope for women.

At the present time, among all the peoples of European origin, there is a tendency to remove disabilities resting on a merely sexual basis, and to give to women the same rights and duties

as men possess. An increasingly large body of people are reaching the belief that, whatever the special aptitudes of one sex or the other sex, it is unreasonable to put legal restrictions upon the exercise of what are, after all, simply human psychic activities, which are no more the attributes of one sex than are the more elementary physiological activities of walking or eating. Moreover, it is practically found that the movements of reform in this direction fail to yield the evil results which were formerly anticipated. The International Congress of Women held at Berlin in 1904 showed clearly, even in a country which has been by no means sympathetic to movements for enlarging the sphere of women, that women can meet together to discuss the great questions of social life in a wise and practical manner that gains the respect of men and deprives women of no desirable feminine characteristics.

Education. — In classic times women's education was mainly domestic, only the courtesan being highly trained, and the Spartans alone exercised in gymnastics. Christian monasticism enlarged the feminine world, and even brought women into closer contact with men and with foreign countries; it was therefore an advance in education when the convents became the chief school for girls. Humanism and the classic renaissance stimulated the production of learned women in new branches of culture, and even produced women professors (notably at Bologna), but fostered no real growth in feminine education. In England Protestantism led to a new development of educational opportunities for boys, but to no new similar opportunities for girls. The girls' public day schools, the best type of girls' secondary schools in England,

were not established until 1872. In America, with some exceptions, all teaching institutions—primary, secondary, and high—are co-educational. There has been much discussion concerning the advantages of the co-education of the sexes. In rural primary schools it is frequently a necessity; for all classes of schools its moral tendency is generally recognized as good on both boys and girls; in higher education it ensures that women shall have the best available training. At the same time, a rigidly complete co-educational system scarcely seems altogether to the advantage of women. It means that they shall receive a kind of education which has been built up exclusively to meet masculine requirements. The ideal education for girls would seem to be a general co-education, with some degree of adaptation to the special needs of woman's organization and the special conditions of the average woman's life.

The successive steps in the development of the higher education of women in Britain are shown in the following *résumé*:—In 1833 the Birkbeck Literary and Scientific Institution opened its classes to women, and Queen's College was started in Harley Street, London, for an improved system of female education (1848). These were followed by Bedford College, London, in 1849, the Yorkshire Ladies' Council of Education in 1865, and by the Ladies' Educational Society in Liverpool in 1866. Then came, in 1869, Girton College at Cambridge (beginning at Hitchin), and Newnham College in the same city in 1875. At Oxford Somerville Hall and Lady Margaret Hall were both formed in 1879, and in 1886 St. Hugh's Hall was inaugurated with a system of cheaper fees. Although they can participate in the university examinations for degrees,

women have not yet been admitted to graduation by Oxford and Cambridge. For degrees there are other universities open to them, however, among them those of London, Wales, Durham, Manchester, Liverpool, Leeds, Birmingham, Sheffield, Dublin (since 1904), and the four universities in Scotland. The principal colleges for women, in addition to those mentioned, are Westfield College at Hampstead (1882), Royal Holloway College (1887), St. George's Training College in Edinburgh, and St. Margaret's College in Glasgow (1893).

Edinburgh University has the credit of first opening its doors to women as students of medicine in 1869; then followed the foundation of the London School of Medicine for Women (1874). When the conjoint Colleges of Physicians and Surgeons of Edinburgh and Glasgow agreed to admit women to their diplomas (1886), the Edinburgh School of Medicine for Women was founded. In 1894 Edinburgh University recognized the classes of both of these institutions as qualifying for its examinations and degrees without admitting, as in the faculty of arts, women to the medical classes in the university. See *Education of Girls and Women in Great Britain*, by C. S. Bremner (1897), an admirable work.

Present Position of Women.—Some professions, such as that of law, are still nearly everywhere closed to women; in many respects, as in matters pertaining to divorce, women are on a different footing from men; and in very few states are women yet allowed to have any voice in the making of the laws which they are compelled to obey. It is possible that some of the legal disabilities of women are founded on a comparative natural disability, and that the law has merely enforced and

generalized the existing natural tendencies. If that is so, there need be the less hesitation in removing such restrictions; while the advantage is gained that a minority are, by the removal of such restrictions, enabled to exercise the unusual aptitudes with which they are endowed. Some years ago the various governments of Europe showed great eagerness in enlisting women in their postal and telegraph services; female labour was more docile, and it was apparently cheaper. But experience demonstrated that the docility was counterbalanced by a lack of adaptability and of staying power, and the cheapness by a lack of resourcefulness and initiative; so that, as Garland's inquiries have shown (*Economic Journal*, June 1901), most of the European administrations of the Postal Union are very discriminating in the employment of women telegraphists, and some have ceased to admit them altogether. The fears or the hopes of those who anticipated that women would oust men from what had previously been regarded as peculiarly masculine avocations are altogether groundless. The work of the sexes, wherever it can be compared, shows different characteristics, and there is ample room for each sex to display its special qualities. It is probable that the leaders in women's movements have in the past been mistaken in seeking to direct women too exclusively in the lines of men's activities, and in holding up masculine ideals for women to imitate. As Stanley Hall points out, the women of the future will treat as a matter for glory rather than for shame those characteristics of their constitution which lead up to maternity, at once the greatest function of the species and the special function of women. See Otis

Mason's *Woman's Share in Primitive Culture* (1894); T. Wright's *Womankind in Western Europe* (1869); L. Eckenstein's *Woman under Monasticism* (1896); G. Stanley Hall's *Adolescence* (1904); Havelock Ellis's *Man and Woman* (4th ed. 1904); Theodore Stanton's *The Woman Question in Europe* (1884); Mrs. Ogilvie Gordon's *The International Council of Women* (1904). See also MARRIAGE.

Women's Clubs. These institutions are now numerous. In London there are the Beechwood (residential), the Empress, the New County, the Green Park (open to those 'eligible for court presentation'), the Ladies' Imperial, the Ladies' Athenæum, the Ladies' Army and Navy, the Ladies' Automobile, the Ladies' Empire, the Ladies' Town and Country, the New Era, the Portman, and the Shuttleworth. Several of the men's clubs admit ladies as visitors, and a few of the ladies' clubs admit men as guests. Among other leading ladies' clubs in London are the University, 32 George Street (500 members; entrance fee, one guinea; subscription, one guinea); the Writers', 10 Norfolk Street (350 members; entrance fee, one guinea; subscription, £1, 11s. 6d. and a guinea respectively for town and country members); the Pioneer (temperance), in Grafton Street (650 members; entrance fee, three and two guineas, and subscription the same, for town and country members respectively); and the Lyceum, 128 Piccadilly, in which membership is confined to women who have published any original work in literature, journalism, science, and music, who have university qualifications, or are the wives and daughters of distinguished men. Club-houses have also been opened in Berlin, Paris, and Florence.

Women's Suffrage. See SUFFRAGE, WOMEN'S.

Wongrowitz, tn., Prussia, in prov. of and 30 m. N.N.E. of Posen. It has an interesting old church, which belonged to a Cistercian monastery. Pop. (1910) 6,851.

Wön-san (Jap. *Gensan*; Chin. *Yuan-shan*), treaty port in Broughton Bay, on E. coast of Korea; exports gold, fish, and hides. The total trade was valued at £449,400 in 1910. It is being connected by railway with Söul (136 m. N. by E.), and an extension N. to Hamheung is contemplated. Pop. 42,000, of whom about 7,500 are Japanese.

Wooburn, par. and tn., Buckinghamshire, England, 4 m. S.E. of Wycombe; has paper and millboard mills. Pop. 3,300.

Wood, in popular language, is practically synonymous with timber; botanically, the term is used interchangeably with xylem. In the first sense wood is found only in trees; in these xylem, forest-shadowed in the axial strand of mosses, and clearly recognizable in the ferns, attains its full development. Only stems and large branches furnish wood, in the popular sense; technically, the wood is continuous, extending into the twigs and leaves. The constituents of wood are to be found in the fibro-vascular bundles that form, so to speak, the circulatory system of the plant, whether in a fern or a forest-tree. These bundles are made up of xylem, or wood elements, conveying the water, laden with earthy salts, and absorbed by the roots, to the leaves for elaboration; and phloem, or bast elements, by which the elaborated sap is returned to nourish the growing parts. Till they reach the stem, these wood elements are on the upper side. Consequently their bending round, when passing from a branch into the stem, brings them towards the centre. For the same reason the bast elements, till then under-

lying the wood, will be turned towards the outside. The essential tissue of the xylem, or wood, is called 'tracheal,' because it consists of wood-vessels (technically *vasa* or *tracheæ*), arising from the fusion of a longitudinal row of cells, and tracheids, developed from a single cell. In both cases the cell protoplasm has disappeared, and the walls have become thickened by the deposition of lignin, to which substance (probably a modification of cellulose) the hardness of wood is due.

In the first year's growth these bundles are arranged round the central pith, at some distance from each other. With the second year's growth the cambium ring is formed, stretching from bundle to bundle. New cells are given off from this ring, both internally and externally. The former are modified into wood elements, and the latter into bast elements, so that in each successive year the cambium ring is carried farther and farther from the centre, near which is the oldest wood, while the oldest bast is at the circumference. There is a marked difference between the wood formed in the spring and that of the autumn growth. In the former the walls of the vessels are thin, and consequently the passage is large; in the latter the lignification of the walls diminishes the size of the passage. Of course the autumn wood, with its closer grain, bounds the rings of any given year. These annual rings are used to ascertain the age of a stem. Duramen, or heart wood, is the name given to the dark central portion of the stem of old trees; the outer portion, by which the watery solutions absorbed by the roots are carried up to the leaves, is the alburnum, or sapwood. Till a tree attains maturity, the annual rings increase in

breadth; there is then a stationary period, followed by a decline in the quantity of woody material laid down. Rarely, however, is the breadth of a given ring uniform, especially when trees are crowded together. The pale lines running from the centre to the circumference are the medullary rays, which convey elaborated sap to the inner part of the stem and store up reserve food. They consist of elongated cells in rows, varying in width and depth, but are not vertically continuous. In recent years the uses of wood have been multiplied. It is greatly used for the manufacture of the cheaper kinds of paper; from wood threads are spun (Kellner-Türk process), and from the yarn, known as licella, a good serviceable cloth, used in place of jute or cotton cloth, has been produced. Among other flourishing industries are the manufacture from wood fibre of artificial silk, artificial hair, straw for the manufacture of hats, and the distillation of wood for the production of sugar and alcohol. See H. M. Ward's *The Oak* (1892) and *Timber and Timber Trees* (1894), and Strasburger's *Text-book of Botany* (1903).

Wood, Sir Andrew (d. 1515), Scottish admiral, was a native of the old Kirkton of Largo, Fife-shire. Originally a merchant trader, he showed great skill and enterprise in defending himself against English, French, and Portuguese pirates. For his services to James III. he obtained, in 1483, a charter of the lands and village of Largo, and received the honour of knighthood. To revenge the defeat of five English ships by him off Dunbar in 1488, an English seaman or admiral, Stephen Bull, set sail for the Firth of Forth in July 1490; but Wood succeeded in driving the English ships on the sandbanks at the mouth of the Tay, where

Bull was compelled to surrender. Wood was afterwards employed on various expeditions by James IV. He must be distinguished from his eldest son of the same name.

Wood, or A Wood, Anthony (1632-95), English antiquary and biographer, was born at Oxford. He is the author of the *History and Antiquities of Oxford*, published in Latin (1674), the English edition appearing in 1786-96. Wood's *Athenæ Oxonienses*, a personal history of distinguished Oxonians between 1500 and 1690, appeared in 1691-2. This last work was construed into an attack upon Lord Clarendon, and Wood was expelled from the university. He was, however, at length permitted to return to Oxford. A third volume of the *Athenæ Oxonienses* was printed in 1721. Wood also wrote *The Ancient and Present State of the City of Oxford* (1773), and *A Survey of the Antiquities of the City of Oxford*, ed. by A. Clark (1895). His *Autobiography* was edited in 1892 by Clark, who further wrote *The Life and Times of A. Wood* (4 vols. 1895).

Wood, Ellen, better known as **Mrs. Henry Wood** (1814-87), English novelist, was born in Worcester. In 1836 she married Henry Wood, of the consular service, and spent the next twenty years abroad. Shortly after her return to England she began to publish novels, which won her instant popularity. *Danesbury House* (1860) was the first, and *East Lynne* followed in 1861. *Mrs. Halliburton's Troubles* (1862) and *The Channings* (1862) were less melodramatic, but no less popular, than *East Lynne*. In 1867 she founded the *Argosy*, a magazine in which her work subsequently appeared—the 'Johnny Ludlow' tales (1874-1880) being her best literary work.

Wood, Sir Evelyn (1838), British general, was born near Brain-

tree, Essex. In 1854 he served with the Naval Brigade in the Crimea, and was severely wounded at Sebastopol. Exchanging into the army, he served throughout the Indian mutiny (1858). Six months afterwards, while still employed in hunting down rebels in the jungles, he won (1858) the Victoria Cross. Wood's next employment was in the Ashanti war (1873-4). After the Gaika (Kaffir) war (1878) he raised a force known as 'Wood's Irregulars,' consisting of 1,000 friendly Zulus. Two days after the British reverse at Isandlwana he surprised and defeated a large force of the enemy, inflicted further loss upon them at Kambula (March 29), and took part in the battle of Ulundi (July 4). His services were rewarded with a K.C.B. (1879). During the Boer war (1881) Wood, on the death of Sir G. Colley at Majuba (February 27), assumed the command of the British forces. During the next three years (1882-5) he was engaged in Egypt, where, as sirdar (1883-85), he began the reorganization and training of the native army. He was adjutant-general to the forces (1897-1901), and in 1903 was created a field-marshal. He commanded the 2nd Army Corps (1901-5). He has written *The Crimea in 1854-94* (1895), *Cavalry at Waterloo* (1896), *Achievements of Cavalry* (1900), *From Midshipman to Field-Marshal* (1906), and *The Revolt in Hindustan* (1908).

Wood, JOHN GEORGE (1827-89), popular writer on natural history, was born in London; worked for some time in the anatomical museum at Oxford. His first book, like his last, was an *Illustrated Natural History* (1851), and between that and his death he produced no fewer than fifty-nine works. He was not a scientist, but a popularizer, and he was thoroughly successful in making

natural history interesting. See *Life* by his son (1890).

Wood, WILLIAM (1671-1730), English ironmaster, was born at Wolverhampton; was among the first to use pit coal in the manufacture of iron. It was to him that the patent was issued to coin halfpence and farthings for Ireland (1722). Though the coins were better than Ireland had, they were much poorer in quality than the corresponding English coins. Dean Swift's *Drapier Letters* brought down the storm the Irish Parliament invoked, and the patent had to be surrendered (1725), Wood receiving a pension of £3,000 in compensation.

Woodbine, a name used by Shakespeare to refer to the honeysuckle, though Milton used it much more loosely. In earlier times it was applied to most twining or climbing plants.

Woodbridge, mrkt. tn., Suffolk, England, at the head of the Deben estuary, 7 m. E.N.E. of Ipswich. St. Mary's church has 14th-century tower. Pop. (1911) 4,623.

Woodbury, WALTER BENTLEY (1834-85), English inventor, was born in Manchester. In 1852 he joined the rush to the Australian goldfields. He returned to England in 1863, and began making experiments in photography with a view to photographic engraving. In 1866 he patented the process called by his name, which formed the foundation of the more modern photogravure process.

Woodburytype. See PROCESS WORK.

Wood-carving. See CARVING.

Woodchat. See SHRIKE.

Woodchuck. See MARMOTS.

Woodcock (*Scolopax rusticula*), a bird belonging to the sub-family Scolopacinae, and closely related to the snipe. It occurs as a breeding species in Britain, as well as throughout

northern and central Europe and Asia, and is also found abundantly in the British area as an autumn migrant. The woodcock reaches a length of over fourteen inches, and is greatly prized for the table. The colouring is a combination of brown, gray, and buff, with black markings, and there are two transverse buff stripes at the back of the head. The birds frequent woods, especially marshy woods, and feed upon worms, insects, and molluscs. During the breeding season the cocks have a habit of following certain tracks in the woods—called the 'cock roads'—and while traversing these they utter whistling notes. The nest is a depression lined with dry leaves, in which four eggs are laid. The young are often carried about by the parents between the thighs. In the eastern part of N. America the British woodcock is represented by *Philohela minor*, a smaller form. See Shaw's *Woodcock and Snipe* (1904).

Woodend, tn., Victoria, Australia, 48 m. by rail N.N.E. of Melbourne. In the vicinity are the celebrated 'Hanging Rock' and Camel's Hump (the highest point on Mt. Macedon). Pop. 1,000.

Wood-engraving is exactly the reverse of steel-engraving, where the parts to be printed are cut out and the ink rubbed into the lines thus made. In a wood engraving the parts to appear white are cut away, and those to be printed are left untouched. Several kinds of wood have been used, but by far the most suitable is box. Boxwood being seldom obtainable of sufficiently uniform texture for engraving purposes over four inches in diameter, blocks of larger size than this are built up. This is done by a method of mortising, deep grooves being cut in the side of each piece and a slip of hard wood inserted. Great

care has to be taken that all edges and surfaces are planed dead true. The engraving is done, not on the side, but on the end of the wood. The boxwood block, when built up, has a surface much too smooth to draw upon. It has therefore to be prepared for this or 'grounded.' This is done by rubbing a little water-colour white evenly over its surface with the ball of the thumb, and when this is dry it can be freely worked upon with either pencil or brush. Sometimes the drawing to be engraved is made directly upon the block, every line exactly as it is to appear when printed, but, of course, the reverse way; sometimes a tracing is made of the original, reversed down, and then worked up in black line facsimile. When this is finished, the block is covered with paper to keep the design or picture from injury.

For the actual engraving three kinds of cutting tools are used, each in several degrees of fineness—gravers, tint tools, and scorpers or gouges. Some engravers use tools having slightly convex cutting edges, and known as 'spit stickers.' When he starts work upon a new block, the first thing the engraver does is to remove a small portion of the protecting paper from its face. On the part of the design thus exposed he makes with his graver a cut on each side of every drawn line. This stage is called 'outlining,' and the operation is repeated section by section till the whole block is treated; then, if the subject be a line drawing, the scorpers are used to cut away the parts which should appear white on the print. This done, the block is ready for proving. To prove a block, the ink is dabbed lightly and evenly over its surface by a silk 'dabber,' a piece of India paper placed gently upon it, and rubbed firmly with the

burnisher over the work: between the burnisher and the India paper a card should be placed to take the friction.

To engrave a wash drawing, the procedure is slightly different. The picture is outlined where the outlining is needed, as before; but as each section is outlined, the protecting paper is replaced over it. When the outlining is completed, the block is again gone over section by section, this time with the tint tool; and it is his manipulation of the tint tool which brings out the best skill of the engraver. By it he has so to line the block that flat washes will appear when printed as they do on his copy, and not as simply a number of lines; by it, too, he gives the texture of sky, clouds, foliage, grass, sea, or whatever else his subject requires. When all is done, the whites are removed with the scorpor, and the block is proved as in the case of the line drawing. Should an alteration be necessary, a hole is drilled about two-thirds through the block; into this hole a tightly-fitting boxwood plug is driven, cut off, planed flush, and the new engraving executed upon it.

In the last quarter of the 19th century improvements in printing machinery and in photography powerfully affected the art of wood-engraving. The former rendered possible the adequate reproduction of very finely engraved cuts; the latter, by enabling subjects to be photographed direct upon the wood, dispensed with the laborious process of drawing. The photographer, by means of the half-tone process, has contrived to dispense with engraving altogether; so that, although letterpress illustration was never more abundant than it is now, very little of it is engraved on wood. Illustrations which, even when done in sections, would have required

days to engrave on wood, are produced in a few hours by process. The half-tone block, when well printed, gives a very soft effect, but lacks texture and vigour, and is in many cases, where the best results are required, engraved upon; so that although pure wood-engraving is fast disappearing before the process block, there is still a field for the artistic wood engraver in rendering his triumphant rival a worthy successor. See P. Kristeller's *Kupferstich und Holzschnitt in vier Jahrhunderten* (1905), and other works mentioned under ENGRAVING.

Woodford, urb. dist. and par., Essex, England, 10 m. N.N.E. of St. Paul's, London, near the southern boundary of Epping Forest. It is a residential and holiday resort. Pop. (1911) 18,497.

Woodgate, SIR EDWARD ROBERT (1845-1900), British major-general. Serving in the Abyssinian campaign (1868), he was present at the capture of Magdala. He was also actively engaged in the Ashanti war (1873-74), taking part in the capture of Kumassi. In the Zulu war (1879) he distinguished himself at Kambula and Ulundi, while in 1899 he commanded the Lancashire brigade in S. Africa, crossing the Tugela with Warren in December, and on January 23 occupying Spion Kop. On the following day he was severely wounded, and died on March 23.

Wood Green, urb. dist. and par., Middlesex, England, 7 m. N. of St. Paul's, London, of which it forms a suburb. Here is the Alexandra Palace, a building of a similar nature to the Crystal Palace. Pop. (1911) 49,372.

Woodhall Spa, tn., Lincolnshire, England, 7 m. s.w. of Horncastle. Its mineral spring (discovered 1811) is efficacious in rheumatic, neuralgic, cutaneous,

and other maladies. Pop. (1911) 1,484.

Woodhead, GERMAN SIMS (1855), English pathologist, born at Huddersfield, was educated at Edinburgh University, Berlin, and Vienna. He afterwards was engaged in teaching anatomy and pathology, and in carrying on original investigations on these subjects in Edinburgh (1879-90). In 1890 he became director of the laboratories of the Conjoint Board of the Royal Colleges of Physicians (London) and Surgeons (England), and from 1892 to 1895 acted as assistant commissioner to the royal commission on tuberculosis. He received the chair of pathology at Cambridge University in 1899. He has identified himself closely with the temperance movement, and is president of the British Medical Temperance Association. His publications include *Practical Pathology* (1883); *Pathological Mycology*, with Arthur W. Hare (1885); *Bacteria and their Products* (1891); *Report to Royal Commission on Tuberculosis* (1895), etc.

Woodhouse, eccles. dist. and vil., W. Riding, Yorkshire, England, 5 m. E.S.E. of Sheffield; has coal mines and sawmills. Pop. 4,000.

Woodhouselee. See TYTLER, ALEXANDER FRASER.

Wood-ibis. See TANTALUS.

Wood-lice (Oniscidea), a group of isopod Crustacea, whose members are adapted for a terrestrial life. The body is usually oval, convex above and concave or flat below; the head is small; the thorax consists of seven segments, each of which bears a pair of walking limbs; the abdomen is short, and its appendages are converted into breathing organs. The wood-lice inhabit damp places, are usually nocturnal, and are vegetarian in diet. Very common in gardens and hothouses

are the so-called 'slaters,' the two most frequent forms being *Oniscus asellus* and *Porcellio scaber*; the former has a smooth and the latter a tuberculated coat. The pill wood-louse (*Armadillidium vulgare*), which is capable of rolling itself into a ball, formerly enjoyed a great reputation in medicine, being taken in the rolled-up condition as a pill. On the seashore, among stones, the large *Ligia oceanica*, which attains a length of more than an inch, is common.

Wood Naphtha. See PYROXYLIC.

Wood Oil. See GURJUN BALSAM.

Woodpecker, a general name for the members of the large family Picidæ, which is usually regarded as including two sub-families—the woodpeckers proper and the soft-tailed wrynecks. The woodpeckers are climbing birds, the feet having two anterior and two posterior toes. The head is large, the neck very muscular, and the tongue exceedingly long and worm-like, with a barbed and horny tip. It can be shot out to a great distance, and is sticky, so that the insects upon which the birds feed adhere to it. All woodpeckers are shy, solitary birds, inhabiting woods. When in search of food they climb trees in a spiral fashion, clinging closely with the claws, assisted by the tail. At the breeding season the woodpecker excavates a hole in the stem of a tree, at first horizontal, then downward to the depth of a foot or more. At the bottom of the excavation the pure white eggs are laid. Certain of the woodpeckers, notably the spotted forms, produce in spring a curious drumming noise, apparently made by the bill hammering on the bark of a branch. Three species of woodpecker occur in Britain, but none can be said

to be common. The green woodpecker (*Geococcyx viridis*) is the largest species, reaching a length of twelve and a half inches. Its loud laughing cry is supposed to foretell rain, hence its name of rainbird, while it also receives the names of yaffle and woodwale. The great spotted woodpecker (*Dendrocopos major*) occurs, though infrequently, throughout England, and in suitable localities in Scotland; while the smaller spotted form (*D. minor*) is confined to the south of England. The former is black and white, with a crimson nape; the latter, somewhat similar in colouring, has the back barred with white on a black ground. A large number of other woodpeckers are distributed throughout the world, except in the Australian region, Egypt, and Madagascar. Mention may be made of the tiny piculets (*Picumnus*) of S. America and the Oriental region.

Wood-preserving. See TIMBER.

Wood Pulp, a material largely employed for paper-making, and obtained by disintegrating wood. The wood fibres are separated either mechanically or chemically. The first variety is prepared by grinding the wood under water, and is of inferior quality, as the fibres are short and readily discolour. In the superior kinds, prepared by chemical means, the wood is cut up and boiled under pressure with solution of caustic soda, sodium sulphide, or, best of all, calcium bisulphite, and the resulting soft product is pulped, pressed, washed, and bleached. See PAPER.

Woodruff (*Asperula odorata*), a dainty little hardy plant belonging to the order Rubiaceæ. It bears little white flowers in early summer, and its dried leaves have a delicious hay-like scent, which persists for a long time. The woodruff or *Waldmeister* is

used in Germany for the flavouring of May wine or *Maitrank*.

Woods, MARGARET LOUISA, née BRADLEY (1856), English novelist and poet, was born at Rugby, and married Rev. Henry Woods in 1879. Her published novels are *A Village Tragedy* (1887); *Esther Vanhomrigh* (1891), a story dealing with the 'Stella' episode in Swift's life; *The Vagabonds* (1894), a clever study of circus folk's life; *Weeping Ferry* (1898); *Sons of the Sword* (1901); *The King's Revoke* (1905); *The Invader* (1907). Her poems are *Lyrics* (1888); *Lyrics and Ballads* (1889); *Æromancy, and other Poems* (1896); *Wild Justice* (1896); *Songs*, privately printed (1896); *Poems New and Old* (1907). Mrs. Woods has also published a historical drama, *The Princess of Hanover* (1902).

Woods and Forests. George III. surrendered the crown lands in the United Kingdom to the nation in return for a fixed civil list, and they are now regulated by two commissioners of woods, forests, and land revenues, under the supervision of the Treasury. The management of the crown foreshores was transferred to the Board of Trade in 1866. The commissioners have powers of leasing crown lands for ordinary purposes for thirty-one years, for mines for sixty-three years, and for building, gardens, etc., for ninety-nine years. They may sell or exchange any lands, etc., except royal forests, parks, or chases, and may enfranchise copyholds. It is their duty to obtain as large an income as they can from crown property, without allowing any part of the capital value to be sacrificed with that object. The crown has power to appoint a surveyor-general of woods, forests, and land revenues in place of the commissioners. The surplus income of the woods and forests,

which annually amounts to about half a million, is handed over to the Exchequer.

Wood's Halfpence. See WOOD, WILLIAM; and SWIFT, JONATHAN.

Woodsia, a genus of small ferns, generally with densely-tufted fronds. *W. alpina* (or *W. hyperborea*) is a native of Britain, and it, as well as *W. obtusa*, *W. polystichoides*, and *W. caucasica*, are desirable cool-house or hardy species, whilst the Mexican *W. mollis* is a fine greenhouse fern.

Wood-sorrel. See SORREL.

Wood-spirit. See PYROXYLIC.

Woodspoint, tn., Victoria, Australia, 70 m. E.N.E. of Melbourne; has gold mining. Pop. (tn. and dist.) 2,000.

Woodstock. (1.) Municipal borough, Oxfordshire, England, 8 m. N.E. of Witney. Manufactures gloves. Near the town is Blenheim Park and Palace (formerly Woodstock), granted to the Duke of Marlborough in commemoration of his great victory in 1704. Pop. (1911) 1,594. (2.) Formerly PAPENDORP, tn., Cape of Good Hope, forming an eastern suburb of Cape Town. Pop. 30,000. (3.) Town, cap. of Oxford co., Ontario, Canada, on the Thames, 78 m. S.W. of Toronto; has manufactures of woollen goods, furniture, musical instruments, agricultural machinery, leather, and soap. Electric power is supplied from Niagara. Butter and cheese are exported. Pop. 10,500.

Wood-swallow, a name given to the members of the passerine family Artamidae, which are Australian birds of doubtful position. In habits they show some resemblance to swallows, but are probably much more nearly related to the shrikes.

Woodward, BENJAMIN (1815-61), Irish architect. With Sir Thomas Deane he designed

Queen's College, Cork (1846-8); became partner with Sir Thomas and his son in Dublin (1853); and built Trinity College new library (1853-7). His greatest work, however, is the Oxford new museum, which he erected (1855-60) under the supervision of Ruskin.

Woodward, HENRY (1832). English palæontologist, keeper of the department of geology in the British Museum (1880-1901), was born at Norwich, and became an assistant in the British Museum (1858) under Sir Richard Owen and his brother, Dr. Woodward, Owen's principal assistant. He next joined Robert Macandrew (1860) on a dredging expedition to the south coast of Spain and the Mediterranean. For many years he has been the leading British authority on crustacea and mollusca. He has written monographs on the *Merostomata* (1866-78), and on *Carboniferous Trilobites* (1883-4).

Woodward, SAMUEL PICK-WORTH (1821-65), English naturalist, was born at Norwich. In 1836 he was engaged as an assistant by Turner, the botanist; in 1838 he found employment in the British Museum, and later in the Geological Society. He became professor of geology at an agricultural college (1845), and returned to the British Museum in 1848 as a first-class assistant in the geological department. He became a great authority on invertebrate fossils, especially fossil mollusca. He published (1851-6) *Manual of the Mollusca*.

Woodwork. — *Artificial.* — About one-eighth of all the timber used is wasted as sawdust and shavings. Sawdust mixed with common glue forms what is called among carpenters 'boman-tigum,' and it makes a paste, which, if properly prepared, sets and can be carved like wood. Cocoa-nut shells powdered are also available, and may be treated

in the same way. A tough, elastic, artificial wood is made by combining 'short fibre,' or bits of wood two inches long bruised into threads, with the paste made of finely-sifted sawdust. Artificial wood can be made waterproof by mixing it with a solution of potassium bichromate. Wood paste is very useful to fill up cracks or knot-holes in wood, and for all repairs; carvings can be perfectly restored with it, and very good furniture can be made with fibre-paste.

If we take wood shavings, the thinner the better, and use strong glass-paste, they will, when wet, bend like paper, and can be applied to any surface, like veneering. By pasting one layer of shaving on another, taking care to cross alternate layers, we can make boards which do not readily split or curve. Oil-glue should be used, and pressure employed during the process. Boats, masts, bows, or any articles requiring strength and flexibility, as also ornaments and musical instruments, can thus be made. See Leland's *Wood from Shavings* (1899), Hartleben's *Manual of Artificial Wood and Shavings* (1900), and Lambert's *Artificial Wood* (1900).

Decorative. — Ordinary woodwork can be decorated by a number of easy processes. The first of these is by cutting patterns with a gouge and indenting the ground, or by simple outlined and stamped work, the 'sunk cutting' or intaglio being stained black or brown. Poker work by burning or pyrography may be applied to all kinds of woodwork; the same is perfectly imitated by painting with Vandyke brown. Venetian marquetry is executed by drawing patterns on wood with a penknife. The cut is filled with black wax, and the 'islands' of the pattern are separately stained, the whole being then varnished.

Another method is to draw bold patterns on wood, of an old ivory or yellowish brown colour. Outline these with a small fluter gouge, and paint the hollows a dark brown, and varnish. Inlaying wood with silver or brass wire is very simple. A groove is cut or lined with a penknife, into which line the wire must fit exactly. Turn the two ends of the wire thus , lay it in the groove, and with a hammer drive the ends in. Sheet metal in small pieces can also be hammered into wood. Inlaying of various kinds is largely applied to wood. Imitation metal inlay consists of gilding or of the application of bronze powders with size. See *Decorative Wood Work* (1901), by Leland and Dawson (Arts and Handicrafts Series).

Wool is the fibrous growth on the skin of various kinds of sheep, and differs from hair in being more elastic and having the scales that clothe the core of the fibres more projecting and more pointed; thus the fibres are capable of being felted together and spun into a firm thread. Wool has a specific gravity of 1.3, is not affected by weak acids, though readily acted on in alkalis, and is very similar in composition to horn. In its natural state wool is charged with about 40 per cent. of a grease called yolk or suint, largely composed of a complex alcohol, cholesterol. For textile purposes wool is chiefly obtained from S. America, Australia, New Zealand, S. Africa, and India; a comparatively small amount is produced in Great Britain or Europe, though that of certain localities has special applications, as in the case of the Silesian, Cheviot, and Southdown wools. For the processes of manufacture, see **WOOL TEXTILES**.

Woold, or **WELD**, or **DYER'S WEED** (*Reseda luteola*), is a native British plant, bearing yellowish-

green, mignonette-like flowers, and having a stem two or three feet in height. It was formerly, and still is occasionally, used for dyeing.

Wooler, par. and tn., Northumberland, England, near the Cheviot Hills, 16 m. s. of Berwick-upon-Tweed. It has large cattle and sheep markets in May and October. Pop. reg. dist. (1911) 4,531.

Woollahra, picturesque residential suburb 3 m. s.e. of Sydney, New South Wales. Pop. 12,500.

Woollett, WILLIAM (1735-85), English draughtsman and engraver, was born at Maidstone. In 1761, when he engraved the *Niobe* of Richard Wilson, he established his reputation as the best engraver of landscape in England. In 1776 he widened his sphere by engraving West's *Death of General Wolfe*, on which his fame rests. He was appointed historical engraver to George III.; engraved West's *Battle of La Hogue* (1781) and pictures by Claude, Wright, Carracci, and Vernet. See Fagan's *Catalogue Raisonné* of his works (1885).

Woolman, JOHN (1720-72), American religious essayist, was born in W. Jersey, of a Quaker family, and early took up an apostolate against slavery, and finally induced the Quaker community to abandon all participation in the slave trade. His *Journal*, from the purity of its spirit and the grace of its style, has often been reprinted. One of his essays, *A Word of Remembrance and Caution to the Rich* (1793), was reissued as a Fabian tract at the end of the 19th century.

Woolner, THOMAS (1825-92), English sculptor and poet, was born at Hadleigh in Suffolk, and was for many years assistant to Behnes. He became acquainted with Rossetti, was one of the orig-

inal pre-Raphaelite brethren, and contributed poetry to *The Germ*. About 1850 he abandoned idealistic sculpture, and confined himself to portrait medallions; but success did not come, and he joined (1852) the rush to the Australian gold fields. On his return to England (1854) he executed a bust of Tennyson, and from that time (1857) he was kept busy till his death, executing statues and busts—his *J. S. Mill* being the best of the former, the two *Tennysons* of the latter. He became R.A. in 1875, and was professor of sculpture at the Academy from 1877 to 1879.

Woolsack, the seat of the lord chancellor in the House of Lords. It is technically not part of the house, and the reason is that the lord chancellor is not necessarily a peer. It is said that, when the exportation of wool was forbidden in the time of Elizabeth, a woolsack was placed for the lord chancellor to remind him of the source of national prosperity.

Woolsey, SARAH CHAUNCEY (1845-1905), American authoress, born at Cleveland, Ohio, has, under the pseudonym of Susan Coolidge, written *The New Year's Bargain* (1871), *What Katy Did* (1872), *Nine Little Goslings* (1875), *For Summer Afternoons* (1876), *Eyebright* (1879), *A Short History of Philadelphia* (1887), and two volumes of verse (1886-7). She edited *The Diary and Letters of Frances Burney* (1880).

Woolsey, THEODORE DWIGHT (1801-89), American educationist, born at New York. He was appointed professor of Greek at Yale (1831-46); then he became president of the college until 1871. He produced a large number of standard academic text-books and manuals—such as *Plato*, *Æschylus*, *Sepnacles*, *Euclid*, *Herodotus*, and *Pindar*. In his later years he devoted much at-

tention to international law, and wrote *Political Science, or the State Theoretically and Practically Considered* (1877), *Communism and Socialism* (1880). He was also chairman of the American Company of the New Testament Revision Committee (1871-81).

Wool-Sorters' Disease. See ANTHRAX.

Woolston. (1.) An eastern suburb of Southampton, England, on the l. bk. of the Itchen. Pop. 4,000. (2.) Town, South Island, New Zealand, in Selwyn co., adjacent to Christchurch. Pop. 3,000.

Woolston, THOMAS (1670-1733), English deist, was born at Northampton, and became a fellow of Sidney Sussex College, Cambridge. A close study of Origen caused him to lose his faith in the literal truth of the Scripture narrative, and he conceived it to possess only an allegorical meaning. His volume, *The Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived* (1705), was much read, though its statements are obscure. Becoming aggressive, he lost his fellowship (1721), and was deposed from the ministry. After that his controversial tone became more bitter, particularly in *The Moderator between an Infidel and an Apostate* (1725), in his *Discourses* (1727-9), and in his *Defences* (1729-30), until he was prosecuted for blasphemy and profaneness, and spent the remainder of his life in prison. His works were published in 5 vols., with *Life*, in 1733.

Wool Textiles are conveniently classified as (1) fabrics produced on the woollen principle; (2) fabrics produced on the worsted principle; (3) fabrics usually classified under the name 'stuffs.' The difference between the woollen and worsted principles is mainly one of yarn (*i.e.* thread) construction, or arrange-

ment of the fibres composing the threads. Leeds and district work principally upon the woollen principle, Huddersfield principally upon the worsted principle, and Bradford principally upon the stuffs principle. But Bradford produces also large quantities of worsted fabrics, as does Leeds; while Huddersfield, in part, employs the woollen principle, often producing cloths possessing both woollen and worsted characteristics. Originally the west of England and the Scottish trades were based upon the woollen principle, but in these districts to-day many varieties of structure are produced. In France, Elbeuf takes the place of Huddersfield, and Roubaix the place of Bradford. Great Britain has a large trade in yarns.

In the woollen trade, as a rule, the manufacturer buys his own raw materials, spins his own yarn, and weaves it up into cloth, which he sells. But the woollen spinners of Belgium and the north of France spin only, and sell their yarn.

FABRICS PRODUCED ON THE WOOLLEN PRINCIPLE.—*Raw Materials.*—The materials employed consist of (1) wools, principally the shorter varieties. (2) Noil—*i.e.* the short fibres taken out of wools in the combing operation, the longer fibres being employed for worsted yarns. (3) Re-manufactured materials, principally mungo or shoddy. Mungo is produced by tearing up ordinary wool suitings; shoddy by tearing up fabrics composed of the longer wools. (4) Cotton or cotton sweepings, which, being usually of a fair length of staple, act as a kind of binding round which other material—say mungos—centre and form a compact thread. (5) Fud and flocks—the waste or 'fly' from the various machines employed in woollen and worsted manufacture.

The cheap cloth trade of the Batley, Dewsbury, and Yeadon district of Yorkshire is based entirely upon the cheaper materials, while the Scottish and west of England tweed trades have been built upon the genuine article.

Processes of Yarn Construction.

—If the wool is received in the raw state, it must be scoured—i.e. thoroughly cleansed—and this is usually effected by passing it through three or four machines charged with soap and alkali and rinsing solutions, and finally passing it on to the dryer, which delivers it to the blender. Upon the blender's choice of materials for mixing depend both the quality and the price of the resultant yarn. Having selected his materials, he builds up a stack of these by placing a layer of one material, then a layer of another material, and so on. This stack is then beaten down with sticks, air blasts being sometimes applied to effect or assist in this operation. Willowing refers to the passing of the blend through a willow or spoked drum machine, while teasing refers in like manner to passing the blend through the teaser—a finer machine more nearly approaching the card, which mixes the fibres more finely. As a rule, the blend is then allowed to 'mellow' for a few days or weeks.

The operation of carding consists in thoroughly separating and mixing the individual fibres of which any blend is composed, the result being a uniform film or sliver of wool, from 60 to 80 in. wide, and say $\frac{1}{4}$ in. thick, which is broken up in the condenser into sixty or eighty slivers or pith-like filaments, which are eventually spun into threads on the mule. The carder itself consists of a number of cylinders clothed with 'card clothing,' which tease out the fibres and recombine them again to form

a film, which is again teased out, and so on. The material as it comes from the teaser is fed on to a lattice at one end of the carder, and this gradually carries it within reach of the revolving cylinders, which alternately draft and condense it—i.e. draw it out into a thin film, and then add film to film until it is finally ready for the true condensing, which will split it up into pith-like filaments ready for the mule. The last cylinders, by a very simple arrangement, split the film up into, say, one-inch slivers, which are wound on spindles ready for being passed to the next operation.

The operation of 'mule spinning' is as follows:—First, the condensed sliver, as received from the carder, being too thick for thread, must be drawn out or drafted—i.e. say one yard drawn out to two yards (or a draft of two); secondly, to prevent the sliver from breaking, a little twist must be inserted during the drafting; thirdly, when drafting is accomplished, the necessary twist must be inserted; and finally, the spun yarn must be wound into the spindle. The mule effects all these processes as the carriage recedes or runs out. As the carriage runs in, the spindles not only wind up the yarn spun, but by means of the faller wire build it up into a firm 'cop,' from which the yarn can eventually be clearly drawn for warping or weaving.

Processes of Fabric Construction.—Upon receiving the yarn from the spinner, the manufacturer arranges the warp in the loom. The shuttle is arranged to take the spool, or cop, upon which the weft yarn is wound by the mule. The most recent important development in power-loom construction is the 'North-rope loom,' in which, when a cop has been emptied, an automatic

motion forces out the empty spool and inserts a full spool, without stopping the loom.

The operations which the loom performs in producing a piece of cloth are as follows:—(1.) Shedding—*i.e.* dividing the warp into two parts, between which the shuttle can lay the weft, there being at each successive passage of the shuttle a change of the threads raised and depressed. (2.) Picking—*i.e.* throwing the shuttle through the various sheds formed, a length of weft being left in each successive shed, and the cloth thus built up at the rate of say sixty picks per minute for heavy looms and fabrics, and say 150 picks per minute for light looms and fabrics. (3.) Beating-up—*i.e.* by what is termed the 'reed' pressing or beating each successive pick or weft thread close to the previous pick, thus forming a firm texture. (4.) As the cloth is produced, it is wound on to the cloth beam; at the same time the warp is unwound from the warp beam, so that there is a constant succession of unwoven warp for the shuttle to work upon. These two operations are termed 'taking-up' and 'letting-off.'

Processes of Finishing.—When the woollen fabric leaves the loom, it is usually uncouth, harsh, and anything but inviting either in appearance or in feel. The following are the processes to which 'all typical woollen cloths are submitted in order that they may receive the requisite finishing:—(1.) Burling and mending, to correct weaving faults as far as possible. (2.) Scouring, to cleanse the fabric thoroughly. (3.) Mending, again to insure a perfect piece. (4.) Milling, either in the milling machine, or the stocks, or both, according to the finish required. (5.) Final scouring or washing off, to rid cloth of the milling

agents, such as soap and fuller's earth. (6.) Tentering, crabbing, etc., to set the cloth at a satisfactory width and straighten it for the subsequent processes. (7.) Raising on the 'gig,' to produce the necessary pile or to assist in clearing the fabric of loose rough hairs. (8.) Cropping or cutting, to leave a fibre pile of a uniform height, or, if necessary, to cut off all raised fibres, thus leaving a clean face. (9.) Pressing, to secure the required gloss or handle according to requirements. To obtain lustre, crabbing, steaming, or boiling are employed.

FABRICS PRODUCED ON THE WORSTED PRINCIPLE.—The worsted trade of Britain, by its absolute bulk, and also by being mainly located in one district, has, quite unlike the woollen trade, split up into several sections—*e.g.* the wool trade; the preparing and combing trade; the drawing and spinning trade; the manufacturing trade; the dyeing and finishing trade; merchandising. Similar subdivisions obtain in France and Germany, and the same tendency is distinctly manifesting itself in the United States of America.

The Wool Trade.—The two main branches are the English and the colonial. A third miscellaneous class includes mohair (Turkey and Cape), cashmere, and a few special hairs employed in peculiar textures which become fashionable from time to time. Great Britain produces three classes of wool—(1) lustre, from Lincoln and Yorkshire; (2) demi-lustre, from Leicester and Devon; (3) short—*i.e.* South Down and Hampshire. Formerly Australia produced only Botany (merino sheep) or fine wools; but to-day certain districts have imported the long-wool Lincoln sheep and crossed it with the merino, thus producing what is known as

colonial cross-breed. The Argentine exports long wool approaching the English long wool. This is of course grown from English stock. English wools are marketed in the greasy or washed state according to local conditions.

The Preparing and Combing Trade.—The two classes of wools—long and short—are treated differently. Long wool is first prepared by passing it through what are termed 'preparatory gill-boxes'; secondly, combed—i.e. the short fibres (noil) are combed out from the long fibres (top); and, thirdly, these long fibres are 'finished,' or got into a more or less parallel condition, ready for the subsequent drawing and spinning operations. Short wool is first prepared by passing it through a carder in most respects similar to the woollen carder; secondly, it is backwashed (to prepare for the combing operation), which consists in passing the slivers through a cleansing solution, drying over heated drums, and gilling; thirdly, it is combed to divide the sliver into 'top' and 'noil,' and fourthly, it is finished to straighten the 'top' in readiness for the drawing and spinning operations. The preparing gill-box consists of back rollers, running comparatively slowly, which receive the wool; gills—i.e. combs, which receive and comb out the fibres by running at a greater speed than the back rollers; and front rollers, which, running at a definitely greater speed than the back rollers or gills, draft the slivers according to requirements. Thus six slivers may enter the back rollers, yet the resultant sliver from the front rollers will be as thin, or perhaps thinner, than any one of the six slivers entering. The finishing gill-boxes following the comb act on precisely similar lines, only they may be

lighter in build according to the strength of the top to be treated. The carder is similar to the woollen carder, but is arranged to give more of a combing operation, so that the ultimate sliver consists principally of wool fibres lying more or less longitudinally in the sliver. To facilitate this, large swifts, workers, and doffers are employed; and finally the sliver is drawn off from the centre of the last doffer, not from the side, as is the case in woollen carding. There are four main styles of comb employed:—(1.) Lister's comb, for long wools. (2.) Holden's comb, for short wools. The 'tops' produced on this comb are said to spin to a finer thread than the tops produced on any other comb. (3.) Noble's comb. This, from a mechanical point of view, is the most perfect machine, all the motions—with the noteworthy exception of the dabbing brush—being circular. By a change of the 'comb-circles'—easily effected—this comb will comb either long, medium, or short wools. (4.) The Heilman comb. This has only just established a position in this country, but in France it is very largely employed for fine wool. In all combs tufts of wool are held by one end and combed, then held by the other end and combed. Combers generally aim at producing a 'top' which will spin to a stated 'count of yarn'—say 56's, 60's, or 70's. The top is two or three times as valuable as the noil.

In the coloured yarn trade the comber deals twice with the same material. The wool is first combed in the gray or white state, then the 'slubbing dyer' takes the tops in hand and dyes them as nearly as possible to the shade required; finally, the comber again takes them and recombs them, thus straitening the long fibres and extracting all the short ones, which, if left in,

would work out and produce a lumpy uncouth surface in the cloth.

The Drawing and Spinning Trade.—The operations of drawing and spinning consist in passing the tops as received from the comber through from seven to ten or eleven operations, of which the first two or three are practically similar to the gilling operations already described. All the subsequent operations, including the spinning, are 'drawing' operations—i.e. the boxes through which the slivers pass have no gills, but consist merely of back and front rollers, with small rollers or carriers—simply to support the slivers—in place of the gills. In preparing boxes, and in ordinary gill-boxes, the sliver is usually run into cans, but in the following machines it is found more convenient to wind it on to bobbins—these gradually decreasing in size along with the sliver. These bobbins, in conjunction with the flyer, take up the yarn as delivered by the front rollers, and insert the requisite twist for the next operation. Thus, in both drawing and spinning, on this system the operation is continuous: doubling, drafting, and twisting all proceed at the same time—not intermittently, as on the mule. The operations of doubling and drafting practically make the worsted thread, the size or thickness of which depends upon the predominance of drafting over doubling, and the evenness upon suitable drafts and combinations of doublings and drafts.

In the last of the operations—i.e. the spinning—in addition to the doubling and drafting, much more twist is put into the yarn, to make a firm thread. If the yarn is for warp, usually two of the single threads are twisted together. Weft yarns, as a rule, are single, save for certain classes

of goods, in which two-fold yarns yield a better fabric.

Yarns are placed on the market in eight forms—on spools, on double-headed bobbins, on cheeses, on cops, on tubes, in hank, in the warp state, and even on the warp beam.

The Manufacturing Trade.—The worsted coating manufacturer has from 50 to 200 looms, the lining and dress goods manufacturer perhaps as many as 1,000 looms. These, running largely on cotton or other inexpensive warps, and producing light stuff, will require no more capital to run them than 200 coating looms. The looms for the coating trade are usually of a heavy description. For the linings and dress goods much lighter looms can be employed, and a speed of from 150 to 200 picks per minute attained, as against from 70 to 130 for coatings. There is, however, a tendency to employ broad looms for dress goods, with a consequent reduction in speed. The fancy dress trade employs the Jacquard loom. The best manufacturer organizes his own designing department. If the manufacturer is not prepared to incur this expense, he gives the style of fabric that he requires to one of the designing firms; they make perhaps dozens of sketches, and the manufacturer selects the most likely. What figure designing is to the dress goods manufacturer, colour and weave are to the coating and trousering manufacturer. He must employ a complete staff of designers and pattern-weavers. As a rule, neither the coating nor dress goods manufacturer finishes his own goods.

The Dyeing and Finishing Trade.—The remarkable advance in textile chemistry and textile physics has of late years revolutionized the finishing processes. The actual operations in finish-

ing, as applied to dress goods, linings, etc., are many and varied; they include the following: 'Cravenette,' or waterproof and spot-proof process, for worsteds; the 'Pirle,' or waterproof and spot-proof process, for worsteds; the lustre mercerizing process, for giving a silk finish to cotton goods; the mercerizing process, for producing a crepon effect on goods manufactured from cotton and wool; the special permanent finish for Italians—the crabbing, tentering, and singeing operations for the well-known glacés or alpacas, and the brushing, cropping, pressing, etc., operations to obtain the 'Huddersfield finish.'

Merchanting.—Merchants purchase the fabrics either in the 'gray' or in the 'finished' state. The advantages of purchasing in the gray state are very evident: pieces can be stored and dyed to shade, and various finishes applied according to requirements. On the other hand, in the coloured trade the merchant has to run the risk of his colours and styles going out of fashion, and this places him at a disadvantage. In the plain trade—coatings, linings, dress goods, etc.—there is the same mixing up of grades and qualities observable as in the top-making trade.

THE 'STUFF' TRADE.—*Raw Materials.*—For warps, cotton is the material most frequently employed, although worsted, woollen, silk, and linen warps are by no means infrequent. The wefts, as a rule, are Botany, English, mohair, woollen, and silk.

Manufacturing.—In the case of plain goods, such as Sicilians and Italians, the actual manufacturing is very simple, the warps being ordered with the required number of threads and required length from the cotton spinner, and the required weight of weft in the required form from the

worsted spinner. In the case of the figured goods, the conditions are much the same as for plain goods, with the addition of the public designer, who makes the necessary sketches, places these on point paper, and supplies the manufacturer with the necessary cut Jacquard cards.

In the case of plain standard makes, the merchant purchases goods in the gray, and has them dyed and finished according to his requirements. In the case of figured goods, he usually selects the designs to be put on to certain standard cloths. With fancy goods, in which colour, structure, and design play a part, he selects each season the styles most likely to run, only sometimes taking the risk which the 'fancy-man' has always to run. See M'Laren's *Spinning, Woollen and Worsted* (1884); Barker's *An Introduction to the Study of Textile Design* (1903), and *The Analysis and Reproduction of Textile Fabrics* (1903); Fox's *The Power Loom*; Bell's *Jacquard Weaving and Designing* (1895); Beaumont's *Wool Manufacture* (1899), and *Colour in Woven Design* (1890); Stephenson and Suddards's *Ornamental Design for Woven Fabrics* (1897); Burnley's *The History of Wool Combing* (1889); Ashenhurst's *A Practical Treatise on Weaving* (1893); Bradbury's *Calculations in Yarns and Fabrics* (2nd ed. 1906); Herzfeld's *Testing of Yarns and Textile Fabrics* (1898); and Posselt's *Technology of Textile Design* (1889).

Woolton, or MUCH WOOLTON, tn., Lancashire, England, 6 m. E.S.E. of Liverpool; is a residential quarter. Red sandstone is quarried. Pop. (1911) 4,320.

Wool Trade. See WOOL TEXTILES.

Woolwich, metropolitan bor., admin. co. of London, England, 8 m. E. of London, on S. side of Thames: there is a small portion

on N. side. The Royal Arsenal, founded in the time of Henry VII., covers over 600 ac., with a river frontage of one mile. It comprises the laboratory, where ammunition of all kinds is manufactured; gun and torpedo factories; gun-carriage department; saddlery and harness, and ordnance store departments. From 15,000 to 20,000 men are employed. Woolwich is the headquarters of the Royal Artillery; and in the town and neighbourhood are the Ordnance College, large barracks, the Rotunda, a military and naval museum, the Royal Military Academy, and the Brook fever hospital. Pop. (1911) 121,403. See Grinling, Ingram, and Polkinghorne's *A Survey and Record of Woolwich and West Kent* (1909).

Woolwich Royal Military Academy, the school in which cadets are educated for commissions in the Royal Artillery and Royal Engineers. Candidates for admission must pass a somewhat difficult competitive entrance examination, and then join the academy for two years. The terms of payment are £150 per annum for the sons of private gentlemen, but much less for the sons of officers. The academy contains about two hundred cadets, who are organized into a battalion of four companies; and there is also an infantry company, owing to the lack of accommodation at Sandhurst. The governor and commandant holds the appointment for three years, and is selected alternately from the Royal Engineers and the Royal Artillery. Instruction is imparted mainly by the large staff of company officers, and also by civilian professors.

Woonsocket, city, Providence co., Rhode I., U.S.A., on Blackstone R., 15 m. N.N.W. of Providence; with cotton, woollen, and worsted mills. Pop. (1910) 38,125.

Woorall. See CURARE.

Wooster, tn., cap. of Wayne co., Ohio, U.S.A., 52 m. s.w. of Cleveland; has manufactures of engines, boilers, and agricultural implements. It is the seat of a Presbyterian university (1866), which had 625 students in 1910, and of the Ohio Agricultural Experimental Station. Coal occurs in the vicinity. Pop. (1910) 6,136.

Wootton Bassett, par. and mrkt. tn., Wiltshire, England, 6 m. w. by s. of Swindon. It is an ancient town, and figured in Domesday as *Wodeton*. There are large cattle markets, and a trade in agricultural produce. Pop. (1911) reg. dist. 5,174.

Worcester. (1.) Municipal, parl., and co. bor. and city, Worcestershire, England, on the Severn, 15 m. s. of Kidderminster. The present cathedral, in part 11th century, has tombs of St. Oswald, Wulfstan, and King John. There are several ancient churches, an 11th-century commandery, and timbered houses. Manufactures include gloves, porcelain, carriages, machinery, railway signals, sauce, vinegar, and British wines. Pop. (1911) 47,987. (2.) City, Massachusetts, U.S.A., one of the co. seats of Worcester co., 40 m. w.s.w. of Boston. The densely built portion is very irregularly laid out. Worcester is an important manufacturing city, producing foundry and machine-shop products, motor car and bicycle chains, boots and shoes, envelopes, watches, clocks, jewellery, and woodwork. The city is said to be the world's greatest centre for the manufacture of wire and wire novelties. It is the seat of Clark University (110 students in 1910), a Roman Catholic college, and a polytechnic institute. Pop. (1910) 145,986. (3.) Town, Cape of Good Hope, 109 m. by rail E.N.E. of Cape Town, at the base of the Hex River Mts. It is an important centre of viticulture, and

large quantities of brandy, wine, and raisins are produced in the vicinity. Other industries are horse-breeding, ostrich farming, tanning, and wagon-building. Pop. 9,000.

Worcester, EDWARD SOMERSET, SECOND MARQUIS OF (1601-67), inventor of the steam-engine, son of the first marquis, was successively Earl of Glamorgan (1644) and Earl and Marquis of Worcester. He passed much of his time in experimental work at Raglan Castle, his father's seat. Being sent by the king in 1645 to Ireland to treat secretly with the Roman Catholics, his mission was betrayed, and he was imprisoned for treason. Escaping, he remained in exile till 1652, when he returned, and was incarcerated in the Tower till 1654. His *Century of Inventions* was published in 1663. Among these is 'an admirable and most forcible way to drive up water by fire.' In fact, he anticipated the steam-engine. He erected water-works at Vauxhall. See Dicks's *The Life, Times, and Scientific Labours of the Second Marquis of Worcester* (1865).

Worcester, FLORENCE OF. See FLORENCE OF WORCESTER.

Worcestershire, west midland co., England. The surface is diversified, well wooded, and hilly, especially on borders—Malvern Hills, s.w.; Brecon and Cotswold Hills, s.; Lickey and Clent Hills, n. Worcester Beacon (1,395 ft.) and Hereford Beacon (1,114 ft.) are on the Herefordshire borders. It belongs almost entirely to the basin of the Severn; tributaries, Teme, Stour, and Avon. Canals connect the Severn with other rivers. The vales of Worcester (Severn), Teme (Teme), and Evesham (Avon) are very fertile. Hops and small fruit are cultivated. Coal is worked in N. and N.W., and fire clay manufactured at Stourbridge.

There are brine springs at Droitwich and Stoke Prior. The porcelain manufacture (introduced 1751) is extensively carried on; other industries are ornamental tiles, carpets (Kidderminster), iron and chain cables (Nether-ton), needles and fish-tackle (Red-ditch), glass, chemicals, iron (Dudley, Stourbridge), gloves (Worcester). The county returns 5 members to Parliament. The Romans had a station at Droitwich (Salinæ). Area, 693 sq. m. Pop. (1911) 562,383. See *Victoria County History—Worcestershire*, and Andrew's *Memorials of Old Worcestershire* (1912).

Worde, WYNKYN DE (d. 1534), printer, was born at Wörth in Alsace, and came to England about 1476 as Caxton's assistant. In 1491 he succeeded to Caxton's business, but, unlike his master, took no interest in the literary aspect of the work. Between 1493 and 1500 he issued at least 110 books. In 1500 he left Caxton's premises at Westminster for Fleet Street, and there printed small popular books. From 1501 till his death he printed more than 600 books.

Wordsworth, CHARLES (1806-92), bishop of St. Andrews, was born at Lambeth, London; and at Oxford had Gladstone and Manning among his pupils. He was master at Winchester (1835-46), and warden at Glenalmond, Perthshire (1846-54). In 1852 he was elected bishop of St. Andrews, and became a *persona grata* to all parties in the Scottish Episcopal Church. He published *Shakespeare's Knowledge and Use of the Bible* (1864), a *Greek Grammar* (1839), and *Shakespeare's Historical Plays* (1883).

Wordsworth, CHRISTOPHER (1774 - 1846), English writer, youngest brother of the poet, was born at Cockermouth, and became fellow of Trinity College, Cambridge, in 1798, and master

(1820-41). He occupied several important livings in the English Church, and is known as the author of *Ecclesiastical Biography* (6 vols. 1810; 4 vols. 1839), *Who Wrote Eikon Basilike?* (1824, 1828), and *Christian Institutions* (4 vols. 1836).

Wordsworth, CHRISTOPHER (1807-85), bishop of Lincoln, was born at Lambeth, the nephew of the poet and son of Christopher Wordsworth. In 1836 he became headmaster of Harrow, in 1844 canon of Westminster, and in 1850 vicar of Stanford in Berkshire. In 1868 he was appointed bishop of Lincoln. He was frequently involved in controversy—e.g. with the Wesleyans in 1873, and in the great Coates case, where he had refused to institute a clergyman who had purchased a life interest in an advowson (1873-5). He was a prolific writer, and his books are scholarly and profound; among them are *Athens and Attica* (1836); *Greece* (1839); *Correspondence of Bentley* (1842); *Life of Wordsworth*, his uncle (1851); *The Greek New Testament* (1856-60); *The Old Testament* (6 vols. 1864-71); and editions of the early fathers. See *Life by Overton* and *E. Wordsworth* (1888).

Wordsworth, DOROTHY (1771-1855), only sister of the poet, kept house for him in his early struggling days, and shared to a large extent his poetical labours. Her own literary records consist of the *Journals* of her life at Alfoxden and Grasmere (ed. by Knight, 1897), and her *Tour in Scotland* (ed. by Knight, 1874). See *Life* by Edmund Lee (1886).

Wordsworth, JOHN (1843-1911), bishop of Salisbury, was born at Harrow, and was the eldest son of Christopher Wordsworth, bishop of Lincoln. He was assistant master at Wellington College in 1866; fellow of Brasenose College, Oxford (1867); preben-

dary of Lincoln (1870); Bampton lecturer (1881); Oriel professor of the interpretation of Holy Scripture, fellow of Oriel, and canon of Rochester from 1883 to 1885. In 1885 he was consecrated bishop of Salisbury. His publications include numerous volumes of sermons, and works bearing on the Church of England, also *The National Church of Sweden* (1911).

Wordsworth, WILLIAM (1770-1850), English poet, was born at Cockermouth in Cumberland. In 1790 he spent his vacation in France and Switzerland, and after securing his degree at Cambridge (1791) his enthusiasm for the French revolution led him to take up his residence in the former country. When the reign of terror broke out his strong sympathies with the Girondists seemed likely to involve him in danger; but when that movement fell into the hands of Napoleon, the reaction in Wordsworth's mind was intense. He abandoned his early ideals almost in their entirety, and fled to the opposite pole of conservatism.

In 1793 his poems *An Evening Walk* and *Descriptive Sketches* attracted the attention of Coleridge. His friend Calvert, dying in 1795, left the poet a legacy of £900, with a strong expression of his wish that the young man should make poetry the serious business of his life. Wordsworth and his sister now settled down at Racedown, near Crewkerne in Dorset, where they were visited by Coleridge. They then moved to Alfoxden in Somersetshire, in order to keep in touch with the new acquaintance, and from the conversations of the two young poets were born the *Lyrical Ballads*, which appeared in 1798. In this work the original intention was, as Coleridge tells us, that Wordsworth was to endeavour to clothe the events of common life in the spirit of poesy and romance, while

to his companion was assigned the duty of humanizing and spiritualizing the supernatural and romantic. In company with his fellow-poet and his sister, Wordsworth went to Germany in the autumn of this year, spending the winter there with Dorothy, and on his return took up his residence in the Lake district near Grasmere. Here, in 1800, the second edition of the *Lyrical Ballads* was published, with the addition of the preface in which his theory of poetic diction first appeared. At Grasmere also *The Prelude* was begun, the opening part of the great philosophical poem, entitled *The Recluse*, to which the poet always looked forward as the goal of his efforts. In 1802 he married his early schoolmate, Mary Hutchinson. In 1807 he produced two fresh volumes, containing some of his finest verse—the sonnets on *Liberty*, the *Ode to Duty*, and the *Ode on the Intimations of Immortality*, together with the poems suggested by his Scotch tour of 1803. In 1808 he removed from Grasmere to Allan Bank, and finally in 1813 to Rydal Mount, where he passed the remainder of his life. About this time also he secured the appointment of distributor of stamps for the county of Westmorland. The year 1814 saw his second tour in Scotland and the publication of *The Excursion*, the second part of his philosophical poem, and the only part of it published during his lifetime—*The Prelude* not seeing the light until a few months after the author's death. The very unkindly reception given to this work in no wise daunted the poet. *The White Doe of Rylstone* appeared in 1815, *Peter Bell* in 1819, while there followed one another in rapid succession *The Waggoner* (1819), the sonnets on the river Duddon (1820), the *Memorials of*

a Tour on the Continent (1820), and the *Ecclesiastical Sketches* (1822). In 1831 he paid his third visit to Scotland, and saw Scott before the latter's departure on his voyage to Naples; and *Yarrow Revisited* appeared in 1835. On the death of Southey he was appointed (1843) poet-laureate. Thirty-eight years after his death was published all that was written of the *Recluse*.

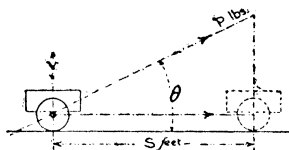
Wordsworth challenges attention both as a critic and as a poet. His critical theories, as contained in his prose prefaces, laid emphasis on the doctrine that between the language of prose and that of verse there is no essential distinction. The language of impassioned prose is also that of poetry. So far Wordsworth's position has won universal consent. But when he asserts that the language of poetry is only that of impassioned prose, he enters on debatable ground. As Coleridge clearly showed, his own practice refutes his dogma; for under no conceivable circumstances could his own finer verses, such as the lines on *Tintern Abbey*, have been used in the speech of ordinary men. In short, while the poet was right in protesting against the hackneyed and unreal poetic diction of his own immediate predecessors, he was manifestly wrong in asserting that there is no place in poetry for a diction removed from that of prose. His other main position is that all the elements of true poetic grandeur are to be found in their greatest purity in the lives of the poor and humble. But here, again, his fondness for pushing his theories into paradox led him sometimes to act on the principle that the mere lowliness and humility of a character or subject makes it necessarily a fit object for the poet. With all his defects in this way, however, it may be affirmed that Wordsworth

has been one of the great critical formative influences of modern poetry. To the generation succeeding his own he appeared as one who, beginning by loving nature for her own sake, had ended by finding in her the key to the mystery of life—one who had discovered in nature that regulative principle of peace and order which seems so strangely lacking in the world of man. To our own generation Wordsworth remains a supreme poet in virtue mainly of that elementary power by which in the end all poets stand or fall—his absolute mastery of language, his power in his highest flights of inspiration to force language to its utmost limits of expressiveness.

Editions of the collected works were published by Moxon under the author's supervision in 1836-7, 1845, and 1849-50. Later editions are John Morley's (1888), Professor Dowden's (1893), and the complete edition produced by Professor Knight in 1896-7, containing life, prose prefaces, etc. Selections have appeared under the editorship of Matthew Arnold (1879) and Knight (1888). The prose works are accessible in A. B. Grosart's edition (1876). The principal *Lives* are those of Christopher Wordsworth (1851); F. W. H. Myers (English Men of Letters Series), 1880; J. M. Sutherland (1887), Elizabeth Wordsworth (1891), and Professor Knight (1889). See also the first-hand sketches in De Quincey's *Recollections of the Lake Poets* (ed. 1889); Cottle's *Early Recollections of Coleridge* (1837); Crabb Robinson's *Diary* (1869) and *Memorials of Coleorton*, containing many letters (1847). Also Knight's *English Lake District* (1878), and *Through the Wordsworth Country* (1887); Stopford Brooke's *Theology in the English Poets* (1874); Hudson's *Studies in Wordsworth* (1884); Legouis's *Jeunesse de*

Wordsworth (1896; Eng. trans. 1897); Masson's *Wordsworth, Shelley, etc.* (1874); J. R. Tutin's *Wordsworth Dictionary of Persons and Places* (1891); Raleigh's *Wordsworth* (1903); and the Wordsworthian studies in Bradley's *Oxford Lectures on Poetry* (1909).

Work, in mechanics and engineering, is measured as the product of the resistance overcome and the distance through which it is overcome. This may be also stated as the product of the effective force and the distance through which it acts. In this country three distinct units are employed. The erg is the c.g.s. (centimetre-gramme-second) unit, the foot-poundal is the British scientific unit, while the British engineer's unit of work is the foot-pound. The work done by a force in foot-pounds is the measure of the



Work Diagram.

effective component of the force in pounds multiplied by the distance in feet through which it acts. Thus, if a body of 100 lbs. weight is raised 6 ft. against gravity, then 6×100 foot-pounds of work are done on it. It has then gained potential energy, and can do, neglecting friction, 600 foot-pounds of work in sinking back to its original position. This illustrates the conservation of energy. When the force, say a pull of P lbs., makes an angle θ with the path, then on the level, through a space s feet, the work done is $SP \cos \theta \times s$ (foot-pounds), $P \cos \theta$ being the

effective component of the force. Such a pull would be measured by a traction dynamometer or simple spring balance. If an agent does work at the rate of 33,000 foot-pounds per minute, it is working at the rate of one horse power. Work may be expended in straining a body, such as a spring; this stores mechanical energy, which will be given back when required, except what has been dissipated in friction. The equation of work is simply an application of the conservation of energy. Supposing 100 foot-pounds of work be given to a machine, then, if there be no waste or store of energy, exactly the same amount, 100 foot-pounds of work, should be given out by the machine in some more convenient form. In theoretical investigations connected with machines this loss by friction is frequently neglected, and the equation of work is applied; but the results so obtained are only approximately true. In the case of a particle moving in space under a system of applied forces, if ds be an arc of the path of a particle and s the tangential component of the applied forces, the work done on the particle between any two points is $\int s ds$ between proper limits. With rectangular co-ordinates this becomes—

$$\int \left(x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds} \right) ds,$$

where XYZ are the three component forces parallel to the three axes. If the resultant of XYZ be perpendicular to ds , then

$$x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds} = 0,$$

which shows that, if the direction of motion of a body be always perpendicular to the acting force, no work is done. In a conservative system of forces

$$\int \left(x \frac{dx}{ds} + y \frac{dy}{ds} + z \frac{dz}{ds} \right) ds$$

depends on the initial and final conditions, and is independent of the path pursued, and the expression under the sign of integration is equivalent to a complete differential. If this be $-dv$, where v is the potential energy, the equation $\frac{1}{2} \Sigma (mv^2) + v = H$ may be obtained, H being a constant and $\frac{1}{2} \Sigma (mv^2)$ the kinetic energy of the system. Hence the sum of the kinetic and potential energies of the system is constant, which is the conservation of energy.

Workhouse. See POOR LAW.

Workington, munic. bor. and seapt., Cumberland, England, on the Derwent; has manufactures of steel rails, boilers, and motor vehicles, and shipbuilding. Coal is mined in the district. Pop. (1911) 25,099.

Workman, WILLIAM HUNTER (1847), American traveller, was born at Worcester, Massachusetts, and qualified for medicine. After practising for thirteen years, ill-health compelled his retirement. Since then he, accompanied by his wife, Fanny Bullock, has travelled extensively throughout Europe, Asia, and Africa. Together they have achieved many climbing feats, including the higher Himalaya (1898-9), three pioneer ascents in the Karakoram Himalaya (1899), an exploration of the Chogo Lungma glacier in N. Baltistan (1902-3), explorations in Kashmir (1906), and in 1908 explored the Hispar glacier and descended the Biafo glacier. He was awarded for his topographical research in Himalaya the prize medal offered by the French minister of commerce. Workman has published, jointly with his wife, *Sketches on Wheel in Fin de Siècle Iberia*, *In the Ice World*

of *Himalaya* (1900), and other mountaineering works.

Works and Buildings,

COMMISSIONERS OF, consist of a salaried first commissioner, the principal secretaries of state, and the president of the Board of Trade. They were appointed by an Act of 1851, and were entrusted with the management of the royal parks, Trafalgar Square, the Menai bridge, and many public works. By later acts they took over the Supreme Court buildings at Edinburgh in 1852, fifteen public statues in London in 1854, the Royal Courts of Justice in 1865 and 1871, the Bankruptcy Courts in 1868, the Ordnance Survey and the county courts in 1870, the customs buildings in 1879, the Inland Revenue buildings in 1881, the site of Millbank prison in 1892. Under the Ancient Monuments Protection Acts, 1882 and 1892, they may take charge of ancient public monuments. The metropolitan police courts were transferred from their custody to that of the London County Council in 1897, and the Victoria, Battersea, and Kennington parks, the Chelsea embankment, and the Bethnal Green Museum garden were transferred to the predecessors of the London County Council in 1887. In Ireland there is a separate Board of Public Works, whose duties are wider than those of the commissioners in England.

Workshops, REGIMENTAL. By the King's Regulations officers commanding units are authorized to establish workshops for training soldiers in various trades. In July 1906 a War Office committee reported in favour of the general extension of these workshops, in order to give a soldier a better opportunity of obtaining employment upon his return to civil life.

Workshops Regulations. See FACTORIES AND WORKSHOPS ACTS.

Workshop, mrkt. tn., Notts, England, 12 m. N.N.E. of Mansfield. Coal-mining, malting, and woodwork (Windsor chairs, etc.), and the manufacture of chemicals and agricultural implements, are the principal industries. The great gatehouse is the remnant of a priory founded in the time of Henry I. From the number of mansions in the neighbourhood the district has been named the 'Dukeries.' It forms part of Sherwood Forest. Pop. (1911) 20,387.

World, in a strict sense, refers to the inhabitable globe, the area of human activities, rather than to the physical earth as a whole, to which it is sometimes applied.

World, THE, an English society journal, founded by Edmund Yates in 1874, in partnership with Grenville Murray. Edmund Yates died in 1894, when Mr. Francis Drummond succeeded to the editorship. In 1905 the controlling interest in the *World* was acquired by Lord Northcliffe, and Mr. Cosmo Innes became editor. A new feature of the journal was introduced in 1910 by the publication of 'Spy's' cartoons, while its illustrated supplements of foreign travel resorts and its society notes abroad appeal to a wide public.

Worm, the thread of a screw. If the thread is arranged to engage the teeth of a cog-wheel and the screw be turned, it gives a slow movement to the wheel. This is one method of obtaining a slow speed of rotation from a high one like that of an electric motor.

Wormditt, tn., East Prussia prov., Prussia, 45 m. s.s.w. of Königsberg. Pop. (1910) 5,668.

Worm Grass. See PINK ROOT.

Worms, tn., Hesse-Darmstadt, Germany, on l. bk. of Rhine, 10 m. by rail N.N.W. of Mannheim; has manufactures of leather,

cloth, tobacco, machinery, and chemicals, and produces the Liebfrauenmilch wine. Its Romanesque cathedral dates from the 8th century; its main portions from the 11th and 12th centuries. In the Lutherplatz is the Luther monument (1868). Originally the Celtic Borbetomagus, Worms was a Roman town till the 5th century, when it was made the capital of the Burgundian kingdom. It was repeatedly the residence of the Frankish kings (Charlemagne, etc.). Annexed to France in 1801, Worms was finally annexed to Hesse-Darmstadt in 1815. Some of the more stirring events in the history of Worms find a place in the *Nibelungenlied*. Pop. (1910) 46,821.—DIETS OF WORMS, meetings of the representatives of the old German empire which took place at Worms. In 1495 the emperor asked for the aid of the empire for an expedition to Italy, and agreed to allow the proclamation of a perpetual public peace in consideration of the establishment of a tax, called the common penny, upon all property, and of a poll-tax. The diet also recognized the Imperial Cameral Court, which was to have supreme jurisdiction in cases between the states of the empire, and to have power to pronounce the ban of the empire. In 1521 a still more famous diet met here. It had to consider—(1) measures to stop private war; (2) the appointment of a government during the emperor's (Charles v.) absence in Spain; (3) the attitude to be adopted towards Luther; (4) the French war; (5) the succession to the hereditary dominions of the Hapsburg house in Germany. The Edict of Worms was issued by the diet which met in 1521. The pope had issued a bull against Luther, who came to Worms under a safe-conduct, but refused

to recant. On April 19, 1521, Charles v. declared him a heretic, and in May the diet issued an edict condemning him and his party.

Worms, or VERMES, formerly constituted an important grade in the classification of animals, but more recent research has shown that many of the so-called 'worms' are unrelated to one another. The term has, however, still a certain convenience, but it should be carefully noted that the elongated flexible body which is the connotation of the term as popularly used is an adaptive character pure and simple, fitting its possessors for a particular mode of life. Among fish, among amphibians, among reptiles ('blindworm') there occur wormlike organisms. Zoologically, the following may be called worms:—The Platyhelminthes, or flatworms, including flukes and tapeworms, and their allies, some of which are not wormlike in shape; the Nemertea, or ribbon worms; the Nematelminthes, or roundworms, including several of the parasitic 'worms' of man; the Annelida, or segmented worms, including earthworms and their allies, the marine worms, the leeches, and some small divisions; also a considerable number of smaller groups, some of very uncertain position, as, for example, the curious 'worm' *Balanoglossus*.

Worms, INFECTION BY. The most common worms that infest the human subject are the Cestoda or tapeworms, and Nematoda or round worms. Among the Cestoda, the common tapeworms, *Tania solium* and *Tania saginata* are the most frequently seen. The important disease induced by *Tania echinococcus* is fully described in the article HYDATID DISEASE. The presence of tapeworms is indicated by a variety of symptoms, which

are for the most part of a trivial character. Restlessness at night, indigestion, anæmia, and headache, sometimes associated with irritation at the anus, are the usual symptoms. More rarely convulsions, squint, and other reflex phenomena are met with. Not infrequently, however, subjects are infected with tapeworm, and suffer no inconvenience therefrom, and indeed only become aware of its presence by the passage of two or three feet of segments by the bowel. With regard to treatment, many drugs have been recommended. The liquid extract of the male fern (*Lastræa Filix-mas*) is the most reliable drug. The patient should take a dose of castor oil at night, a teaspoonful of the extract early next morning on an empty stomach, to be followed three hours later by another dose of oil. The fragments of worms passed should be examined in order to ascertain if the head has been expelled. Of the Nematoda or round worms, *Ascaris lumbricoides* and *Oxyuris vermicularis* are the commonest. The former is of cylindrical shape, pointed at each end, and from three to five inches long. It lives chiefly in the small intestine, but may wander into the stomach, and may even be discharged by the mouth. Sometimes their presence gives rise to no symptoms; occasionally, and especially in children, diarrhœa, colic, nausea, vomiting, and convulsions may occur. Their presence in the intestine is generally accompanied by extensive eosinophilia in the blood, the existence of which is often of material assistance in diagnosis. The most reliable method of treatment is by means of santonin; for children, two to four grains followed by a saline purge or castor oil; for adults, five grains daily for three days, each

dose to be followed by castor oil. The *Oxyuris vermicularis* or thread worm is an inhabitant of the large intestine. It measures about a half to three-quarters of an inch long. Among the local symptoms, heat and irritation round the anus and nose are common. In children the existence of worms is suggested by restlessness, nervous irritation, sometimes convulsions, or other symptoms suggestive of serious brain disease. In little girls they may cause great distress by creeping into the genital passages, especially during the night. The eggs of the *Oxyuris* are expelled with the fæces. The existence of thread worms is easily verified by administering a mild purgative and examining the fæces. In addition to the use of purgatives, much benefit is obtained from the use of copious enemata of an infusion of quassia or salt and water.

Wormwood, an aromatic herb, *Artemisia absinthium*, which has long been held in high repute for its bitter properties. The plant was of some importance among the Mexicans, women wearing on their heads garlands of wormwood in a certain religious dance. Wormwood is used in the preparation of absinthe. It was formerly also used to keep away moths from clothing.

Wormwood Scrubbs, district in w. of London, with recreation ground, rifle range, and large convict prison.

Wornum, RALPH NICHOLSON (1812-77), English art critic, was born at Thornton, near Norham, N. Durham. After spending six years in the galleries at Munich, Dresden, Rome, Florence, and Paris, he established himself in London as a portrait-painter, but was soon occupied in writing about art; and in 1847 was authorized to issue a catalogue of the National Gallery, a work

so well done that it led to his appointment in 1854 as keeper of the National Gallery. He wrote *The Epochs of Painting* (1847), *Analysis of Ornament* (1856), and *Life of Holbein* (1867).

Worringen, tn., Rhenish Prussia, on the Rhine, 9 m. N. by w. of Cologne. Pop. (1910) 6,735.

Worsaae, JENS JACOB ASMUSSEN (1821-85), Danish archaeologist, born at Vejle in Jutland; was employed in the archaeological museum at Copenhagen (1838-43), and became professor in the university (1854), then (1866) director of the archaeological museum and (1877) director of the national historic museum. He was minister of education (1874-5). His principal works have been translated into English: *Primeval Antiquities of England and Denmark* (1849), *The Danes and Norwegians in England* (1852), and *Pre-History of the North* (1886). One of his best-known publications is *Jylland's Danskhed* (1850), written in opposition to the views of Jacob Grimm.

Worsborough, urban dist., W. Riding, Yorks, England, 3 m. s. of Barnsley; has collieries, gunpowder mills, and sawmills. Pop. (1911) 12,754.

Worsley, urban dist., Lancashire, England, 6 m. w.n.w. of Manchester; has cotton manufactures, iron and brick works, and coal mines. Pop. (1911) 13,906.

Worsted. See YARNS, WOOL TEXTILES.

Wort. See BREWING.

Worth, par. and vil., Sussex, England, 6 m. w. of East Grinstead, has an ancient church said to be the only perfect ground plan of a Saxon church extant in England. Pop. (1911) reg. dist. 5,865.

Wörth, vil., Alsace, Germany, 12 m. s.w. of Weissenburg; was the scene of the defeat of the

French under MacMahon by the Germans under the Crown Prince of Prussia on Aug. 6, 1870. Reichshofen is the name the French give to the battle. Pop. (1910) 1,050.

Worth, CHARLES FREDERICK (1825-95), ladies' tailor and costumier, was a native of Bourne in Lincolnshire. He went to Paris in 1846, and after a time began business as a costumier, in partnership with Bobergh, a Swede, who retired about 1871. Owing to the patronage of the Empress Eugénie, Worth's rapidly gained a reputation as the first house in the world for the design and execution of novelties in fashions. See *Annuaire Bottin* (1859).

Worthing, munic. bor. and wat.-pl., Sussex, England, 12 m. w. of Brighton; includes Heene or W. Worthing. The mother church of St. Mary, Broadwater, is partly Norman. In the vicinity are ancient earthworks. Pop. (1911) 30,308.

Wotton, SIR HENRY (1568-1639), English poet and diplomatist, was born at Boughton Malherbe in Kent. In 1595 he became secretary to the Earl of Essex, but left him before his disgrace, and settled at Venice. In 1602 he was sent, disguised as Octavio Baldi, by the Duke of Tuscany, to warn James VI. of Scotland of a plot against him. James, in gratitude, made Wotton ambassador to Venice in 1603; and here he remained until 1624, when he retired upon the provostship of Eton. His principal works are *Reliquiæ Wottonianæ* (1651); *State of Christendom* (1657); poems, collected in *Hannah's Courtly Poets* (1870). See *Lives* by I. Walton (1651); by A. W. Ward (1898); and by L. P. Smith (1907).

Wotton, WILLIAM (1666-1726), English scholar, was born in Suffolk, and showed a precocious aptitude for languages. In 1694

he published *Reflections upon Ancient and Modern Learning*, which drew down on him Swift's satire in the *Battle of the Books*. He studied Welsh to such purpose that he edited the bardic laws of Hywell Dha, published after his death as *Leges Wallicæ* (1730).

Wotton - under - Edge, par. and tn., Gloucestershire, England, 10 m. s.w. of Stroud; has endowed grammar and blue-coat schools. Pop. (1911) reg. dist. 4,642.

Wounds may be either subcutaneous or open, with division of the integument. A contusion of soft parts and a simple fracture of bone are examples of subcutaneous wounds. Open wounds are described as incised, lacerated, contused, or punctured, according to the manner of their production; but by a more convenient classification cognizance is taken of differences in their processes of repair, and they are divided into those with loss of substance and those without loss of substance. An open wound with loss of substance may heal by cicatrization. A clot of blood forms a crust on the surface, and becomes organized into fibrous tissue, while epithelium from the surrounding skin grows inwards over the whole wound, after which the crust, or scab, falls off. Should the clot break down from putrefaction or from another cause, suppuration takes place, and repair proceeds more slowly by granulation or 'second intention.' In open wounds, without appreciable loss of tissue, the surfaces may be brought into contact and retained in position. A thin layer of coloured clot then becomes organized to form the bond of union between the severed surfaces. This process is called healing by 'first intention.' The surfaces, however, may be kept apart till they become glazed, and may

then be brought together, when union takes place by apposition, the layer of clot in this case being colourless.

Incised wounds are generally clean cuts made by a sharp instrument or by a blow over a bony surface. They usually gape and bleed freely. The surgeon should endeavour to procure healing by first intention. Lacerated wounds present irregularities with more or less tearing of the tissues, and consequently lowered vitality of the edges of the wound, as a result of which sloughing is apt to occur. Contused wounds have the edges bruised and their vitality depressed. They usually heal by second intention, the devitalized tissues being absorbed or cast off as a slough. Punctured wounds are dangerous on account of their depth. They generally heal by second intention, and the surgeon's aim should be the promotion of free drainage, so as to prevent accumulation of fluid and consequent tension below the surface.

In the general treatment of wounds rest, constitutional and local, is essential. Sedatives, such as opium, may be necessary. In all wounds immobility of the adjacent tissues should be secured by splints or other apparatus. A horsehair stitch may act as a sufficient splint in certain positions, and is better adapted to some injuries than more elaborate apparatus.

Poisoned wounds, whether caused by noxious animals, such as snakes, or by microbes and their products, are described under separate articles.

Woundwort, or SAND CLOVER, a hardy herbaceous plant belonging to the order Leguminosæ. It bears spikes of yellow flowers and clover-like leaves. Thriving in the poorest of soils, it has value as a cultivated forage plant. Woundwort is also the popular

name of some species of *Stachys*. See STACHYS.

Wouwerman, PHILIP (1619-68), Dutch artist, born at Haarlem. He worked for a time at Hamburg under Decker, but returned to Haarlem (1640), where he taught painting, and had among his pupils his brothers Jan and Pieter. He was especially famous as a painter of horses. His brother Jan (1629-66) was born and lived at Haarlem, and was a painter of landscapes and canals. Pieter (1623-82), also born at Haarlem, settled at Amsterdam. He was a landscape painter, and assisted Philip.

Wrack. See GRASS-WRACK.

Wrangel, CARL GUSTAF, COUNT (1613-76), Swedish general, born at Skokloster, near Upsala; distinguished himself under Gustavus Adolphus, especially at the passage of the Lech (1632), and under Torstensson; defeated the Danish fleet off Fehmarn in 1644, and was appointed (1645) generalissimo of the Swedish forces in Germany, as well as field-marshal and senator. In 1651 he was created a count. He served under Charles X. in the Polish war, especially in the three days' battle of Warsaw (1656), and followed the king to Denmark, when he took Fredericia (1657) and Kronborg (1658). He was a member of the regency during the minority of Charles XI., and was appointed commander-in-chief during the disastrous war with Brandenburg, ending in the rout of Fehrbellin (1675).

Wrangel, FERDINAND, BARON VON (1794-1870), Russian Arctic explorer, born at Pskov, of Swedish extraction. In 1820 he commanded an expedition to the Arctic regions, and, first in 1817 and again in 1825, made voyages round the world. He was governor of Alaska (1829-34), and from 1853-8 he held the post of minis-

ter of marine. Wrangel wrote some books of travel, the best known being *A Journey on the Northern Coast of Siberia and the Icy Sea* (1841). See Mrs. Sabine's *Wrangel's Expedition to the Polar Sea in 1820-3* (1840).

Wrangel, FRIEDRICH HEINRICH ERNST, COUNT VON (1784-1877) Prussian general, born at Stettin; distinguished himself in the wars against Napoleon. He suppressed the insurrection in Münster in 1837, and in Berlin (1848). In the same year he commanded the German forces in Schleswig-Holstein; and he commanded the allied armies at the beginning of the war with Denmark (1864). See *Life*, in German, by Maltitz (1884).

Wrangel Land. See ARCTIC EXPLORATION.

Wrangler. In old times the word 'wrangle' was used in the universities in the sense of 'to dispute publicly'—that is, to defend or oppose a thesis. Wrangler is now only used to distinguish one who has passed the mathematical examination for the bachelor's degree in the University of Cambridge with such credit as to have had his name inscribed in the highest list, or list of wranglers. Of these the first in merit is the senior wrangler. The second list is that of senior optimes, and the third that of junior optimes. Till 1883 there was only one examination; since then there have been two. Among the senior wranglers have been Professor Airy (1823), Bishop Philpott (1829), Professor Kelland (1834), Bishop Cotterill (1835), Professor G. G. Stokes (1841), Professor Cayley (1842), Isaac Todhunter (1848), Professor P. G. Tait (1852), T. B. Sprague (1853), E. J. Routh (1854), Lord Rayleigh (1865), Professor Niven (1867), Professor Hopkinson (1871), Professor Larmor (1880). In 1890, in part iii., Miss Fawcett was placed be-

fore the senior wrangler. The wranglership is now discontinued. The last was awarded in 1909.

Wrasses (Labridæ), a family of bony fish, including a large number of littoral forms, most abundant in the tropics, and generally possessing curiously thick lips. They feed on molluscs and crustaceans, and have strong teeth adapted for crushing the hard shells of these animals. The body is covered with cycloid scales, and is often brilliantly coloured, and there is a single long dorsal fin, whose spinous portion is greatly developed. Among the wrasses of the type genus may be mentioned *Labrus maculatus*, the ballan wrasse, and *L. mixtus*, the striped or red or cook wrasse, both British. Both species occur in rock pools, and are edible. Among other wrasses mention may be made of the tautog, the goldsinny, and the parrot-fish or parrot-wrasses, while members of the genus *Ctenolabrus* occur off the coasts of both Europe (including Britain) and N. America.

Wrath, CAPE, N.W. extremity of Scotland, Sutherlandshire, 13 m. W.N.W. of Durness church. It is a pyramidal mass, rising 300 ft. sheer out of the sea.

Wraxall, SIR NATHANIEL WILLIAM (1751-1831), author of historical memoirs, was born at Bristol; served the East India Company from 1769-72; then carried on negotiations between Caroline Matilda, queen of Denmark, and her brother George III. Returning to England in 1780 he entered Parliament, transferring his allegiance after a time from the side of Lord North to that of Pitt. His pamphlet, *A Short Review of the Political State of Great Britain* (1787), met with great success. The *Historical Memoirs of My Own Time, from 1772-84* (2 vols.

1815), have had a lasting reputation, and were republished, with continuation to 1790 (3 vols. 1836). H. B. Wheatley's edition (1884) includes some *Reminiscences* before unpublished. Among Wraxall's other works are *Memoirs of the Valois Kings* (1777), and a *History of France from Henry III. to Louis XIV.* (3 vols. 1795).

Wray, JOHN. See RAY.

Wreck, in its original meaning, was the whole or part of a ship cast upon the land; but by the Merchant Shipping Act, 1894, wreck is defined to include also 'jetsam, flotsam, lagan, and derelict found in or on the shores of the sea or any tidal water.' When a vessel is wrecked, stranded, or in distress near the coast, it is the duty of the receiver of wreck of the district to proceed to the spot and take command of all persons present; he may requisition persons, horses, and carts to assist him, and is entitled to pass over adjoining lands, the owner having a charge for any damage on the things rescued. If any wreck is found in the United Kingdom, the finder, if he is the owner, must notify the receiver, or, if any other person, must hand it over to the receiver. If a receiver takes possession of any wreck, he must post a description of it in the nearest custom house, and also send the description to the secretary of Lloyd's, if the value exceeds £20. If the wreck is of small value or perishable, the receiver may sell it. The owner of wreck, if he establishes his claim within a year, is entitled to have the wreck or the proceeds of sale delivered to him upon paying salvage and expenses. In case a wreck is plundered, compensation is to be made in England or Scotland as in cases of riot, and in Ireland as in cases of malicious damage to property. Where a ship has been in distress or wrecked, a

receiver, or at the request of the Board of Trade a wreck commissioner, holds an inquiry into the circumstances, and sends his report to the Board of Trade and to Lloyd's. In the case of unclaimed wreck, if any person has a franchise to claim it, it is to be delivered to that person, after payment of all expenses, salvage, fees, etc.; otherwise it is to be sold, and after deducting expenses the balance is to be paid to the officer of the crown. Harbour and lighthouse authorities have power to remove obstructive wrecks.

The number and tonnage of British vessels lost in 1910 were—173 vessels, with a gross tonnage of 249,927; and of foreign vessels 389, with a tonnage of 341,609.

The number of ships wrecked has called into existence firms or companies whose sole business is the salvaging of sunken vessels. The most practical methods of raising such ships are (1) the closing of all openings in the vessel's hull and then pumping out the water; (2) submerging hollow caissons, lashing them to the hull, and then pumping them out; (3) and lifting, by means of wire ropes or chains placed under the hull and attached to pontoons moored above—in this method the movement of the tide is utilized.

The most recent successful cases of wreck-raising are those of the White Star liner *Germanic*, sunk at the pier in New York harbour (1899); the ex-Spanish cruiser *Reina Mercedes*, sunk at the blockade of Santiago (1898); the *City of Worcester*, sunk in New London harbour (1898); the *China*, at Perim (1898); the *City of Paris*, on the Manacle Rocks, raised in 1898; the *Milwaukee*, at Aberdeen (1898); the H.M.S. *Gladiator* (1908); and a number of ships raised in the United States by the Merritt and Chap-

man Derrick and Wrecking Company. See Fawcett's 'Recent Notable Salvage Operations,' in *The Engineering Magazine* (January 1900); Noaker's 'Raising Wrecks in the Thames,' in *Cassier's Magazine* (May 1898); and Bell's 'Raising Sunken Vessels,' in *Cassier's Magazine* (August 1898).

Wrede, KARL PHILIPP, PRINCE (1767-1838), field-marshal of Bavaria, was born at Heidelberg; fought in 1800 with the French against the Austrians, Prussians, and Russians. After the retreat from Moscow he joined the coalition against France. At Hanau (1813), Napoleon, with an inferior force, beat Wrede, and the allies were compelled to retire. Wrede contributed materially to the success of the advance upon Paris (1814). See Heilmann's *Feldmarschall Fürst Wrede* (1881).

Wrekin. See SHROPSHIRE.

Wren, a general name for the members of the family Troglodytidae, which are passerine birds, most abundant in tropical America, but having in the wren of Europe (*Troglodytes parvulus*) a very familiar representative. The wrens have usually a moderately long and slender bill, the wings are short and rounded, the tail also is usually short, and is frequently carried over the back. The feet are strong, as is also the elongated metatarsus. The common wren reaches a length of about three and a half inches, and has a loud, ringing song, heard throughout the year. It builds a domed nest, and is remarkable for building additional nests, which are apparently used as shelters in unfavourable weather. The food consists chiefly of insects and their larvæ. The other wrens are mostly small birds, some of which, like the warbling-wren or organ-bird (*Cyphorhinus cantans*) of S. America, have considerable

powers of song. The name wren in combination is given to several members of the warbler family. See WARBLERS.

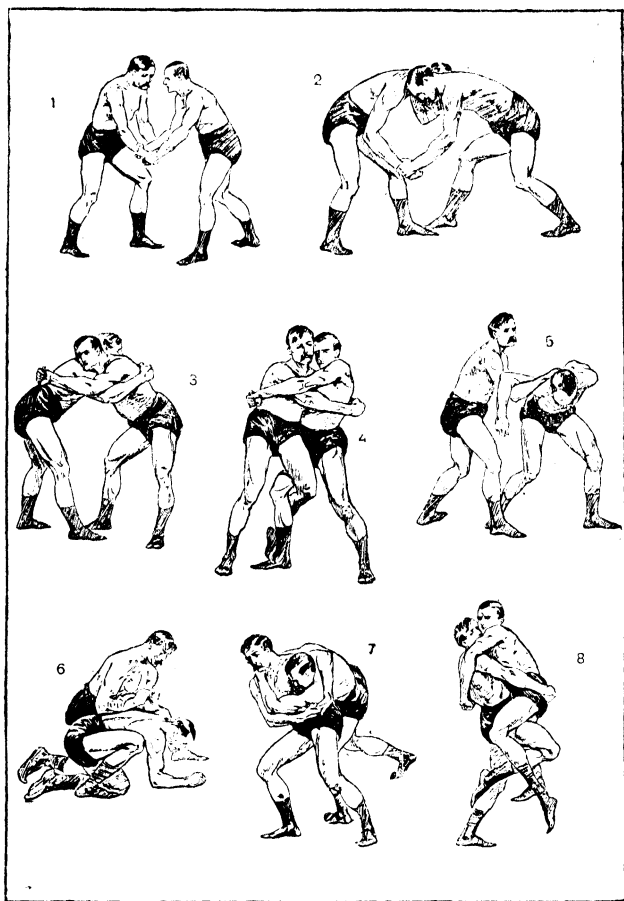
Wren, SIR CHRISTOPHER (1632-1723), English architect, born at East Knoyle, Wilts. In 1637 he was appointed professor of astronomy at Gresham College, London, and four years later Savilian professor of mathematics at Oxford. Wren was one of the original members of the Royal Society. In 1661 he was appointed by Charles II. assistant to Sir John Denham, surveyor-general of the royal buildings, and was commissioned in 1663 to survey and report upon St. Paul's Cathedral with a view to its restoration, and was engaged on the Sheldonian Theatre, Oxford, and Trinity College, Cambridge. After the great fire of London he made a survey of the whole of the ruins, and proposed a plan for laying out the area with wide and commodious streets and squares, and with a line of convenient quays along the Thames. Unfortunately his plan was ignored. He was commissioned to rebuild the Royal Exchange, Chelsea Hospital, the Custom House, Temple Bar, the Monument, and the churches of St. Mary-le-Bon, Cheapside; St. Stephen's, Walbrook; St. Bride's, Fleet Street; St. Andrew's, Holborn; Christ Church, Newgate Street; St. James's, Westminster; further, Greenwich Hospital; Hampton Court; Buckingham Palace; Marlborough House; Ashmolean Museum, Oxford; and part of Windsor Castle. The first stone of St. Paul's, from Wren's designs, was laid on June 21, 1675; the choir was opened for divine service in 1697, and the whole was completed in 1710. Wren became president of the Royal Society in 1680. See *Lives* by Elmes (1852), Phillimore (1881), and Lena Milman (1908), also

Milman's *Annals of St. Paul's* (1868) and Loftie's *Inigo Jones and Wren* (1893).

Wreschen, tn., Prussia, in prov. of and 28 m. E. by S. of Posen. Pop. (1910) 7,246.

Wrestling is common to all nations, and has been brought to a science in countries so widely separated as England, Turkey, India, China, and Japan, each of which has its own laws and methods for the sport. The ancient Greeks held wrestling in high repute, as the public contests for professional wrestlers at Delphi, Corinth, Nemæa, and Olympia testify. History hands down to us the name of Milo of Croton, a great athlete, who for six years carried off the prize for wrestling in the Isthmian and Olympic games. Mr. J. Inouye states that in Japan the recorded history of the sport dates from 23 B.C., when the emperor matched two very strong men, named Kehayer and Nomi-no-Sukune, for a bout. The latter killed the former, and thus came to be tutelary deity of wrestlers in that country. Wrestling tournaments existed in England in the time of the Plantagenets, challenges passing between the cities of London and Westminster; but it appears to have been the pastime of the lower orders only. John Evelyn, in his *Diary*, mentions a wrestling match in St. James's Park (Feb. 1669) for £1,000—an enormous sum at that time—between the champions of the north and the west, which resulted in a victory for the latter. After the early part of the 18th century the sport declined, and it was not until early in the 19th century that a not very successful effort was made to revive it.

Of the many systems we can only mention those existing in Britain. (1.) The Cumberland and Westmorland style claims to



Positions in Wrestling.

1. 'Catch as catch can' hold. 2. First grip, catch hold style. 3. The hold. 4. The link.
5. The 'half-nelson.' 6. The hammer lock. 7. Cross buttock. 8. The hips.

be the best. In this, before the struggle is started, the competitors clasp each other, the left arm of each being over the right arm of his antagonist, and the chin on his right shoulder, with the hands gripped behind him. The object of the contest is to unloose the antagonist's clasp, and this accomplished the bout is won; it is also won if either party is forced to touch the ground with his knee or any part of his person. (2.) In the Cornwall and Devonshire system the wrestlers wear strong linen jackets, and stockings on their feet. The ring is thirty yards in diameter, and each has a 'sidesman,' or second, in the ring. The competitors take up a position opposite each other, stooping, feinting, and dodging in their efforts to get a good hold above the waist. This often takes a considerable time, so that the spectacle is apt to become monotonous. To constitute a 'fall,' two shoulders and one hip, or two hips and one shoulder, must simultaneously touch the ground. Thus, when it comes to ground work, the worsted man tries to keep on his face, and a 'slippery' player may by adroitness long avoid defeat. In fact, so difficult is it to judge a contest of this sort indisputably, that it nearly always leads to wrangling, and this has militated against its popularity. (3.) Lancashire wrestling is on the system of 'catch as catch can,' and the tussle nearly approaches the barbarous. The competitors are nude, except for bathing drawers and stockings; they are allowed to take hold just as they please, and 'throttling' (although nominally disallowed) often enters into the struggle. Two shoulders down secures victory. See *Armstrong's Wrestling* (Badminton Library, 1893); *Robinson and Gilpin's Wrestling and Wrestlers* (1893);

Rich and Bentley's *A New Book of Sports* (1885); F. R. Toomb's *How to Wrestle* (ed. 1905); J. Inouye's *Wrestlers and Wrestling in Japan* (1895); also *Ju-Jitsu*.

Wrexham, munic. bor., Denbighshire, Wales, 11 m. s.w. of Chester. St. Giles's Church has a magnificent 16th-century tower. There are malt, iron, and terracotta works, tanneries, and breweries. Pop. (1911) 18,379.

Wriezen, tn., Prussia, in Brandenburg prov., 32 m. E.N.E. of Berlin. Pop. (1910) 7,407.

Wright, CHARLES HENRY HAMILTON (1836-1909), Irish divine, born in Dublin; delivered the Bampton Lectures (1878), the Donnellan Lectures at Dublin (1880), and Grinfield Lectures at Oxford (1893-7). He was vicar of St. John's, Liverpool (1891-8); and wrote *Grammar of Modern Irish* (1855), *The Fatherhood of God* (1867), *Zechariah and his Prophecies* (1879), *Biblical Essays* (1885), *The Intermediate State and Prayers for the Dead* (1900), *Genuine Writings of St. Patrick, with Life* (1902), *Roman Catholicism Examined* (ed. 1903), *A Protestant Dictionary* (1904), and *Daniel and his Prophecies* (1905).

Wright, JOSEPH (1734-97), English painter, was born at Derby, and made his reputation by pictures of figures illuminated by candle-light, such as *The Orrery*, *The Gladiator*, and *The Air-pump*; but his merits as a portrait painter are also very great. In 1773 he went to Italy, where the masters had less effect on his work than an eruption of Vesuvius which he witnessed. This led him to abandon candle-light pictures for conflagration scenes—not a happy change. He returned to Derby to paint portraits, and was elected R.A. (1784). See monograph by Bemrose (1886).

Wright, THOMAS (1789-1875), English philanthropist and prison reformer, was born in Manchester.

He became interested in the reclamation of discharged prisoners, and in 1838 received permission to become a visitor in Salford prison. Eventually he was offered a prison inspectorship, which, however, he declined. By public subscription an annuity was purchased for him, which set him free to give his whole time to prison work. See *Life* by M'Dermid (1876).

Wright, THOMAS (1810-77), English antiquary, born at Tenbury in Shropshire; and in 1836 went to London and began life as a man of letters. He edited a large number of Early English MSS., both historical and literary. A collection entitled *Reliquæ Antiquæ*, prepared in conjunction with Halliwell, was published in 1839-43. Among his other works are *Biographia Britannica Litteraria* (2 vols. 1842-6); *Essays on Archaeological Subjects* (2 vols. 1861); *The Celt, the Roman, and the Saxon* (1852 and 1885); *History of France* (3 vols. 1856-62). Wright was one of the founders of the Archaeological Association (1843), and of the Shakespeare and Camden Societies. He superintended the excavation of the Roman city of Uriconium at Wroxeter, and published an account of the city in 1872. See Llewellyn Jewitt in *The Reliquary* (1877-8).

Wright, WILLIAM ALDIS (1836), English man of letters, and vicemaster of Trinity College, Cambridge, since 1888; from 1870 to 1885 he was secretary of the Old Testament Revision Committee. His works include editions of Bacon's *Essays* (1862) and *Advancement of Learning* (1869); the *Cambridge Shakespeare* (9 vols. 2nd ed. 1891-3), with W. G. Clark—textually the best edition extant; *Letters and Literary Remains of Edward Fitzgerald* (1839); *Fitzgerald's Letters to Fanny Kemble* (1895); *More Let-*

ters of Edward Fitzgerald (1901); *Works of Edward Fitzgerald* (7 vols. 1903); *Milton's Poems* (1903); *English Works of Roger Ascham* (1904); *Westcott's History of the English Bible* (1905); *A Commentary on the Book of Job* (1905); *Femina* (Roxburghe Club, 1909); and *The Hexaplar Psalter* (1911).

Wrightia, a genus of tropical shrubs and trees belonging to the order Apocynaceæ. They usually have slender branches, and bear cymes of yellow, red, or white flowers, with salver-shaped corollas. They are sometimes grown as 'stove plants, in a light peat soil.

Wriothesley, HENRY, THIRD EARL OF SOUTHAMPTON (1573-1624), patron of Shakespeare, was born near Midhurst, Sussex. At court (1590) his handsome presence made him a favourite both with the queen and with the Earl of Essex. Florio, Nash, Barnes, Markham, and above all Shakespeare, found in him a generous patron. To him in 1593 were dedicated *Venus and Adonis*, and in 1594 *Lucrece*, and there is every probability that he is the patron and friend addressed in the *Sonnets*. For participating in Essex's ill-starred enterprise he was condemned to death. The sentence was commuted, and at the union with Scotland he was released and restored to court favour by James I. In 1624, when an alliance with the Netherlands was formed, he headed an expedition thither, and died of fever at Bergen-op-Zoom.

Wriothesley, THOMAS, FOURTH EARL OF SOUTHAMPTON (1607-67), succeeded to the title in 1624. From Oxford he proceeded to the Continent, where he remained ten years. Returning to England, he ranged himself with the royalists. Cromwell permitted him to remain in England during the commonwealth. At the restora-

tion he became lord high treasurer, an office he held till his death.

Wrist. The strength of the wrist joint is derived chiefly from the numerous tendons, which are bound down close to the surrounding bones, and from the number of adjacent articulations among which shocks are distributed and violence is dissipated. For this reason dislocations at the wrist are rare—a more common result of injury, such as a fall, being a Colles's fracture, in which the lower end of the radius breaks off from the shaft about $\frac{1}{2}$ in. above the articular surface of the joint. A deformity of this joint, known as 'drop wrist,' is common in lead-poisoning, and is due to paralysis of the extensor muscles.

Writer's Cramp is a spasm occurring chiefly amongst those who write much, and especially amongst those who hold the pen in a bad way; and similar spasms occur amongst piano and violin players, tailors, telegraphists, compositors, and others. In its early stage the affection is a true cramp. The writer jerks the pen involuntarily, and is conscious that he grasps it with excessive strength. Pain is often present, and is frequently associated with a feeling of intense fatigue in the muscles of the forearm and the ball of the thumb. A prolonged continuance of the condition may result in scrivener's palsy or paralysis. Electricity, rest, and massage only give temporary relief. Change of occupation is the only satisfactory remedy.

Writers to the Signet. See SIGNET, WRITERS TO THE.

Writing. The methods of writing of the ancients are treated of at PALÆOGRAPHY, HIEROGLYPHICS, INSCRIPTIONS, and PICTURE WRITING. As regards modern writing, previous to the advent of the printing-press writing was divided into bookhand and cursive. Nowadays cursive

writing alone is in use. The development of caligraphy was expedited by the invention of the steel pen, which supplanted the old quill. The rise of the science of graphology, or reading of character by handwriting, which in recent years has attained considerable vogue, affords an indication of the arbitrary character of the art of writing in modern times. See Williams's *History of the Art of Writing* (1907).

Writ of Summons (Lat. *breve*), in English law, a judicial summons ordering a party to appear to answer a claim. Under the Judicature Acts all suits and actions in the High Court (except matrimonial causes, and equity proceedings commenced by originating summons) are now commenced by writ of summons. Writs are issued in the name of the lord chancellor, and are endorsed with a statement of the relief claimed, or where the demand is for a liquidated sum of money, with a statement of the precise sum claimed. Writs require to be served personally, except where the defendant's solicitors agree to accept service, or the court on special grounds orders substituted service on some party other than him to whom the writ is addressed. The numerous forms of original writs in civil procedure have been superseded by a writ of summons—*e.g.* the *audita querela*, a means of relieving a defendant by a matter of discharge occurring after judgment. After having long been practically superseded by stay of execution, it was finally abolished under the rules made by the Judicature Act of 1875. A writ of summons remains in force for twelve months, but may be renewed for six months from time to time by leave of the court.

Wrongous Imprisonment. See FALSE IMPRISONMENT.

Wrotham, urban dist., Kent, England, 6 m. E.N.E. of Seven-

oaks; has a fine Early English church. Pop. (1911) 4,169.

Wroxeter, vil., Shropshire, England, on the Severn, 6 m. E.S.E. of Shrewsbury. Site of Roman *Uriconium*, and large Roman cemetery. Pop. 580.

Wrschowitz, tn., Austria, in Bohemia, an E. suburb of Prague. Pop. (1911) 24,668.

Wryneck (*Iynx*), a genus of birds, related to the woodpeckers, but differing from them in the soft tail, which has no spiny shafts, and the absence of bristles round the nostrils, which are partially covered by a membrane. The plumage is curiously mottled with black, brown, gray, and white, much as in the nightjar. Wrynecks feed upon insects, which they find chiefly upon the ground. They select a decayed branch or post, in whose cavity the eggs are placed. To England the common wryneck (*I. torquilla*) is a summer visitor, but it does not usually extend to the north. It comes about the same time as the cuckoo, hence the name of cuckoo's mate, while its habit of hissing when molested, and at the same time twisting the neck and turning the head about, give it the popular name of snake-bird. This species is widely spread over Europe and Asia, while the other three species are African.

W.S., Writer to the Signet (Scotland).

Wsetin, tn., Moravia, Austria, 40 m. E.S.E. of Olmütz; manufactures furniture, cloth, and sugar. Pop. (1911) 7,584.

Wu-chang-fu, tn., cap. of prov. Hu-peh, China, on r. bk. of Yang-tse-kiang, opposite Hanyang and Hankow; residence of viceroy of Hu-nan and Hu-peh, and of an immense number of officials. A mint and cotton cloth mills have been established. In Oct. 1911 a revolutionary outbreak and mutiny occurred at Wu-chang, and the viceroy had

to take refuge on a Chinese gun-boat. The Wu-chang provincial treasury fell into the hands of the rebels, who also got possession of Hankow, as well as the arsenal at Hanyang. Pop. estimated at 800,000.

Wu-chau-fu, tn., prov. Kwang-si, China, on l. bk. of West R., below the confluence of the Kuei, 125 m. w. of Canton; is the port of transshipment of sea-borne goods for the West; was opened to foreign trade in 1897. The value of the net total trade which passed through the foreign customs during 1910 was £1,647,909. The value of foreign goods imported from Hong-kong was £1,191,625, and the value of native exports of local origin to Hong-kong amounted to £568,558 (chiefly live stock, poultry, tea, groundnuts, wood, hides, silk, and tin). Pop. 65,000.

Wu-hu, tn. and treaty port, prov. An-hui (Ngan-hui), China, on r. bk. of Yang-tse-kiang; exports grain to the S., and has coal, tea, and silk in its neighbourhood. The total net trade in 1910 amounted to £3,321,541, of which £1,829,256 represented exports, chiefly rice (4,264,854 cwt.), tea, rape seed, wheat, feathers, and beans. Pop. 130,000.

Wülfrath, comm., Rhenish Prussia, 7 m. w. by N. of Barmen. Pop. (1910) 10,103.

Wulfstan (LUPUS) was archbishop of York from 1003 till his death in 1023, and at the same time bishop of Worcester till 1016. For him Ælfric wrote his pastoral letter, *Sermo ad Sacerdotes*. In the years 1010-1 Thurkill laid the country waste from East Anglia to Wessex, and these raids formed the occasion of Wulfstan's homily *Sermo Lupi ad Anglos*. Professor Napier, who has edited 'Wulfstan's Homilies' in the *Sammlung Englischer Denkmäler* (1883), accepts four only as the work of the archbishop out

of the fifty-three assigned to him in Wanley's *Catalogus* (1705). See also Napier's *Göttinger Doktorschrift* (1882).

Wülker, RICHARD PAUL (1845-1910), German student of Old English philology, born at Frankfurt-on-Main; was professor of English literature at Leipzig from 1880, and from 1891 editor of the philological journal *Anglia*. Among his works are *Das Evangelium Nikodemi* (1872), *Altenglisches Lesebuch* (1864-80), *Grundriss zur Geschichte der Angelsächsischen Litteratur* (1885), *Geschichte der Englischen Litteratur* (1896; 2nd ed. 1906, etc.); and he edited Grein's *Bibliothek der Angelsächsischen Prosa und Poesie* (1881 ff.), and the second edition of Wright's *Anglo-Saxon and Old English Vocabularies* (1884).

Wullenweber, JÜRGEN (1492-1537), Hanseatic statesman, born at Lübeck; was elected (1533) one of the burgomasters of his native city. He made great efforts to re-establish Hanseatic influence in the Baltic on a democratic and Protestant basis, and initiated a series of reforms in Lübeck, which his enemies overturned at the Diet of Spires. He was at length arrested, delivered to the Duke of Brunswick, and beheaded, his fall marking the end of the Hanseatic maritime supremacy in the Baltic.

Wundt, WILHELM MAX (1832), German physiologist and psychologist, was born at Baden, and began to lecture on medical subjects at Heidelberg; but he has become more widely known as an original and brilliant exponent of philosophy, of which subject he has occupied the chair at Leipzig since 1875. His *System der Philosophie* (1889) embraces his previous work in both science and metaphysics. The fifth edition of his *Principles of Physiological Psychology* has been trans-

lated into English by Professor E. B. Titchener (1904), and occupies a leading place in psychological literature. He is the founder of the 'laboratory school' in psychology, and his followers include Professor Munsterberg and the late Professor W. James.

Wunsiedel, tn., Bavaria, Germany, in Upper Franconia, 20 m. E.N.E. of Bayreuth, in the Fichtelgebirge. Its industries include the manufacture of agricultural and electrical machinery, mineral dyes, and hosiery. In the vicinity there are marble, granite, and limestone quarries. Pop. (1910) 5,841.

Würselen, vil., Rhenish Prussia, 4 m. N.N.E. of Aachen. Pop. (1910) 13,091.

Württemberg, kingdom of the German empire, lying between Bavaria, Baden, and Switzerland, and drained for the most part by the Neckar and its tributaries. The Danube crosses the country towards the S. The most striking geographical feature is the Swabian Alb, the most characteristic portion of the S. German Jura. The Black Forest borders the kingdom on the W. On the whole the surface lies high (3,000 to 1,500 ft.), the greater part belonging to one or other of the S. German plateau systems; but there are many valleys, all of great fertility. Hornisgrinde, on the Baden frontier, attains a height of 3,775 ft. Agriculture is the principal industry. Wine and fruit are produced in large quantity, and market-gardening is actively pursued at Stuttgart, Ulm, Esslingen, Heilbronn, and elsewhere. The breeding and grazing of cattle is an important industry. The agricultural college of Hohenheim, near Stuttgart, is famous. Forests cover 31 per cent. of the area. Salt and iron are the only minerals of consequence. There are mineral springs at Wildbad, Cannstatt, Göppingen,

Hall, Reutlingen, and other places. There is a good deal of manufacturing industry of a varied character, the more important branches producing iron, gold and silver goods, cutlery, fire-arms, machinery, scientific and musical instruments, chemicals, prints and books, confectionery, wine, and beer. Area, 7,530 sq. m. Pop. (1910) 2,435,611. Capital, Stuttgart.

The bulk of the people (69 per cent.) are Protestants; the Roman Catholics, who have a bishop at Rottenburg, amount to 30 per cent., and there are nearly 12,000 Jews. The state university is at Tübingen (2,061 students in 1910), and there is a polytechnical high school at Stuttgart. Education stands at an exceptionally high general level, even for Germany; there is not a single individual in the kingdom over ten years of age who is unable to read and write. Württemberg has four votes in the Federal Council, and returns seventeen deputies to the Imperial Diet. The Württemberg troops constitute the 13th Army Corps of the German army: total strength, about 24,000. The king is a hereditary, constitutional sovereign. The territory now called Württemberg was settled by the Germanic Alemanni in the 3rd century after Christ, and in the 9th was incorporated in the duchy of Swabia. Ulrich (1241-65) was the first count. In 1495 the reigning count was made a duke of the empire; in 1802 the title of 'duke' was exchanged for that of 'elector'; and in 1806 the title of 'elector' for that of 'king.' Between 1802 and 1809 the kingdom was greatly enlarged in area. In 1904 its railway system was incorporated with that of the remainder of Germany. In 1906 the constitution was revised, and three years later a settlement of its educational questions was

effected. See the official *Württembergische Jahrbücher*, and *Der Königreich Württemberg* (1904).

Wurtz, CHARLES ADOLPHE (1817-84), German chemist, was born in Strassburg, studied under Liebig and Dumas, and became professor of chemistry in Versailles in 1851, succeeding Dumas at the Sorbonne, Paris, in 1853. His principal researches, which resulted in the discovery of the substituted ammonias and of glycerol, were on the one hand of as great theoretical importance as his method of preparing phenol was of technical. He was a great teacher, and wrote among other works *Leçons de Philosophie Chimique* (1864; Eng. trans. 1881), and *La Théorie Atomique* (1878; Eng. trans. 1880); he edited a *Dictionnaire de Chimie Pure et Appliquée* (1870-86), and the *Annales de Chimie et de Physique* (from 1852). See *Life*, in French, by Gautier (1884).

Würzburg, episc. see and cap. of prov. Lower Franconia, Bavaria, on the Main, here crossed by three bridges, 70 m. by rail E.S.E. of Frankfort; has manufactures of tobacco and cigars, chocolate, beer, musical and scientific instruments, furniture, machinery, and railway carriages, and carries on a trade in wine. Its Romanesque cathedral was founded in the 9th century, enlarged in the 11th century, and restored in 1882-3. Among its other churches are Saint Burkard, university and seminary churches, Gothic chapel of St. Mary, and the Neumünster church. The Marienberg fortress, which occupies the site of a Roman fort, stands on a hill overlooking the river on the left bank; till 1720 it was the episcopal palace. The new episcopal palace, now the royal palace, a splendid example of the rococo style, was built in 1720. The

Julius hospital in the N.W. part of the city was called after Bishop Julius, who refounded the university in 1582; in 1910-1 it had 1,429 students. Würzburg became an episcopal city in the 8th century; in 1803 the bishopric was assigned to Bavaria. Pop. (1910) 84,494. See Beckmann's *Führer durch Würzburg* (1906).

Wurzen, tn., kingdom of Saxony, Germany, on the Mulde, 16 m. E. of Leipzig; has an ancient castle and a 12th-century cathedral. Machinery, carpets, beer, leather, paper, and biscuits are manufactured. Pop. (1910) 17,203.

Wu-sung, or WOO-SUNG, treaty port, China, prov. Kiang-su, on l. bk. of Hwang-po (known as the Wu-sung in part of its course), at its junction with the Yang-tse-kiang. Lack of water on the bar (average, 19 ft. at spring tides) prevents men-of-war and vessels of deep draught from going up to Shanghai (12 m.). The forts were captured in 1842 by a British fleet; but in 1898, when Wu-sung was made a treaty port, the forts were dismantled. In 1910 the more important portion of a great conservancy scheme was completed by the closing of an old ship canal and the completion of a jetty at Wu-sung.

Wuttke, HEINRICH (1818-76), German historian and politician, born at Brieg in Silesia, was appointed professor of history at Leipzig (1848), but took an active part in public affairs, being one of the founders of the 'Great German Party.' Among his works are *Die Schlesischen Stände* (1847); *Polen und Deutsche* (1847); *Die Völkerschlacht bei Leipzig* (1863); *Städtebuch des Landes Posen* (1864); and *Geschichte der Schrift und des Schrifttums*, of which only one volume appeared (1872-3).

Wuttke, KARL FRIEDRICH ADOLF (1819-70), German theologian, born at Breslau; became professor of theology in Berlin (1854), and Halle (1861). His principal works, all written in an orthodox spirit, are *Geschichte des Heidenthums in Beziehung auf Religion* (1851-3), *Handbuch der Christlichen Sittenlehre* (1861-2; Eng. trans. 1873), and *Ueber die Lehrfreiheit der Geistlichen* (1870).

Wyalong West, tn., Gipps co., New South Wales, 230 m. W. of Sydney; has gold mining. Pop. 5,300 (including Wyalong town, 3 m. to the E.).

Wyandots, N. American aborigines, a branch of the Hurons, who, in the 17th century, moved from Canada to the right bank of the Detroit R., Michigan, and thence ranged into Ohio. In 1832 they ceded their hunting-grounds to the United States government in exchange for some tracts about the Missouri-Kansas confluence. In 1900 only 680 were still in the tribal state, distributed with the Hurons in Indian Territory, in Quebec, and in Ontario. The term Wyandot is often applied collectively to all the northern Iroquois tribes—Hurons, Eries, and others—who did not belong to the confederacy of the six nations, and were exterminated by them.

Wyandotte, tn., Wayne co., Michigan, U.S.A., on r. bk. of Detroit, 12 m. S.W. of Detroit; has iron shipbuilding, and manufactures of chemicals, cement, and salt. Pop. (1910) 8,287.

Wyandotte Cave, in Crawford co., Indiana, U.S.A., 5 m. N.E. of Leavenworth, is 23 m. in length, the most notable division being the pillared palace, 350 ft. long and 250 ft. high.

Wyatt, JAMES (1746-1813), English architect, was born in Staffordshire, and became A.R.A. (1770). He quickly obtained a

large practice as an architect, using first the Græco-Italian style, of which Henton House is a good example. He gradually turned to Gothic, and may be termed the reviver of Gothic architecture, although, owing to his activity as a restorer of cathedrals, he was called by archæologists 'the destroyer.' Among his later works were Fonthill Abbey, Chiswick House, Dodding-ton Park, and Ashridge Castle.

Wyatt, SIR MATTHEW DIGBY (1820-77), English architect and writer on art, was born near Devizes. After making the usual continental tour (1844-6), he published *Geometric Mosaics of the Middle Ages* (1848), and became secretary of the executive of the Great Exhibition (1851). He became Slade professor of architecture at Cambridge (1869). Among his works were Alford House, the Adelphi Theatre, London, the East India Museum; and among his writings *Metal Work and its Artistic Design* (1852), *Industrial Arts of the Nineteenth Century* (1853), and *The Art of Illuminating* (1860).

Wyatt, RICHARD JAMES (1795-1850), English sculptor, was born in London, and began to exhibit in 1818. His work attracted the attention of Canova (then on a visit to England), who invited him to Rome, where he settled and practised his art. Among his most notable works were *Ino and the Infant Bacchus*, *Musidora*, *Girl at the Bath*, and *Penelope*, which was commissioned by Queen Victoria.

Wyatt, SIR THOMAS (c. 1503-42), English poet and diplomatist, was born at Allington Castle, Kent. He is said to have been the lover, before Henry VIII., of Anne Boleyn. He held various offices at court, and was employed diplomatically in France and Italy. He studied Petrarch, and introduced the sonnet to Eng-

land. In 1536 he was imprisoned at the time of Anne Boleyn's disgrace, but was released and knighted. His *Poems* were published in *Tottel's Miscellany* (1557; ed. Arber, 1870); *Collected Poems* (ed. H. Nicolas, 1831). See Monograph, by R. Alscher, in German (1886); W. E. Simonds's *Sir Thomas Wyatt and his Poems* (1889).

Wyborg. See VIBORG.

Wych Elm. See ELM.

Wycherley, WILLIAM (1640-1715), English dramatist, was born at Clive, near Shrewsbury. Part of his early life was spent in aristocratic circles in France. In London he lived the life of a fashionable young man about town. In 1672 he produced the first of his plays, *Love in a Wood*, and immediately became the darling of the court and of society. He followed up his first success with *The Dancing Master* in 1673; but this piece failed to gain the same applause as its predecessor. In 1675 he brought out *The Country Wife*, and in 1677 his dramatic career ended with the production of *The Plain Dealer*. His first comedy was founded on a previous work of Sir Charles Sedley, and the last two plays on Molière, *The Country Wife* being based on *L'Ecole des Femmes*, and *The Plain Dealer* on *Le Misanthrope*. As an exponent of the restoration comedy, Wycherley ranks next to Congreve. His dialogue lacks the polish and the unremitting epigrammatic glitter that marks Congreve's work; but none of Congreve's comedies approach *The Plain Dealer* in character drawing. Of the indecency that the drama of the day delighted in, Wycherley had more than his full share. From an imprisonment for debt he was released by James II., who was a great admirer of *The Plain Dealer*. At the age of sixty-four Wycherley became acquainted with Pope,

then sixteen years of age. See Leigh Hunt's edition of *The Works of Wycherley, Congreve, Vanbrugh, and Farquhar* (1840; reissued 1865); and the edition of *Wycherley* in the Mermaid Series, by W. C. Ward (1893); also Hazlitt in his *English Comic Writers* (1819).

Wycliffe, WYCLIF, or WICKLIFFE, JOHN (c. 1320-84), English religious reformer, is said to have been born at Hipswell, near Richmond in Yorkshire. In 1360 he became master of Balliol College, Oxford; but he soon resigned that post, and held in rapid succession the livings of Fillingham, Ludgershall, and Lutterworth (1374). He was sent as a commissioner to Bruges to consult with the pope's envoys on ecclesiastical matters. His theory of dominion, and his attacks on the papal supremacy, made him popular among the Londoners; and his desire to reform the corruption of the clergy secured for him the support of the nobles, of John of Gaunt, and of the Prince of Wales. In 1377 John of Gaunt was supreme, and in order to secure popular sympathy he projected measures for the confiscation of church property. In retaliation Convocation decided to strike at John of Gaunt through Wycliffe, who was summoned in February 1377 to appear before a council of bishops at St. Paul's; but the council broke up in disorder. Forsaking the use of Latin, Wycliffe henceforward wrote in English. His writings were widely read; his translation of the Bible became very popular; and he organized a body of poor priests, who spread his teaching throughout the land. As the champion of national rights against the papacy, Wycliffe by the time of Wat Tyler's rebellion had become one of the most powerful men in England. He himself had no direct part in inspiring Wat Tyler's

rebellion, but there is no doubt that his poor priests had a considerable if indirect share in organizing the movement. Moreover, Wycliffe's constant denunciations of the wealth of the church, his declaration of the unlawfulness of giving obedience to lay or clerical rulers if their lives were unrighteous, and his praise of poverty, helped to stir up men like John Ball, who sympathized with anarchy. After the suppression of the rising, a general reaction took place, and Wycliffe was attacked by the ecclesiastical authorities. Already in 1380 he had declared against the doctrine of transubstantiation, and his opinions had been condemned by the university of Oxford. In 1382 Archbishop Courtenay also condemned them, and many of his followers were seized and persecuted. Wycliffe was not arrested, and during the next two years lived at Lutterworth. The main characteristic of his teaching was his repudiation of formalism and his insistence on inward religion. Anne of Bohemia, the first wife of Richard II., held Wycliffite opinions; and in Bohemia Wycliffe's writings were very popular among the followers of Hus. The University of Prague, however, condemned them, and they were burnt there, and articles from them were condemned by the Council of Constance and by Pope Martin v. In England the Lollards, in spite of much persecution, carried on Wycliffe's teaching, and Lollardy, it is said, 'smouldered on till the reformation.' In 1428 Wycliffe's bones were dug up and thrown into the river Swift. His English *Works* were published in 1869-71 and 1880 (4 vols.), and his Latin *Opera*, in 17 vols. (1882-92). See G. M. Trevelyan's *England in the Age of Wycliffe* (1889), Loserth's *Wyclif und Hus* (1884), R. L. Poole's *Wycliffe* (1889).

Wycombe, HIGH WYCOMBE, or CHIPPING WYCOMBE, munic. bor., Bucks, England, 29 m. W.N.W. of London. Chair-making and cabinet works, and flour and paper mills, are the chief industries. Pop. (1911) 20,390.

Wye. (1.) Parish and mrkt. tn., Kent, England, 10 m. S.W. of Canterbury, near the riv. Stour. It has an ancient grammar school. Pop. reg. dist. (1911) 5,495. (2.) River, Wales and England, rises on Plinlimmon, flows E.S.E., E., and S. to the Severn estuary. It is famed for its beautiful scenery. Length, 130 m. See *A Book of the Wye*, by Edward Hutton (1911).

Wykeham, WILLIAM OF (1324-1404), chancellor of England, born at Wykeham, Hants. Edward III. appointed him guardian of several of his manors, and clerk of the works at Henley (1348). He was next created surveyor of the king's works at Windsor (1356), and erected the great quadrangle to the east of the keep (1359-69). In 1364 he was appointed keeper of the privy seal, and soon after principal secretary of state, while he also became bishop of Winchester in 1367, and chancellor of England, an office he held the first time till 1371. He was thereafter chiefly occupied in founding two colleges — Winchester College (1387), and New College, Oxford (1380), to which Winchester College was to be the feeder. In 1376 he was accused of malversation of public funds, at the instigation of John of Gaunt, and was deprived of his offices. He was put on his trial, but the attitude of the people became so threatening that it was deemed expedient to drop the proceedings. He then became closely connected with Richard II., and in May 1389, when the king declared himself of age, he appointed the bishop of Winchester chancellor, and the latter held the office till

1391. See *Lives* by Lowth (1758), Walcott (1852), and Moberley (1887).

Wyman, WALTER (1848), American surgeon-general (since 1902), born at St. Louis; has been in the marine hospital service since 1876. He has devoted great attention to the physical conditions affecting the seamen of the mercantile marine. In 1893 he had charge of the measures adopted by government for warding off cholera, and directs the administration of the national quarantine laws. He founded the first government sanatorium for consumption at Fort Stanton, New Mexico, and established a leprosy investigation station at Molokai, Hawaii, in 1906.

Wymondham, par. and tn., Norfolk, England, 9 m. S.W. of Norwich. The church of St. Mary the Virgin comprises part of a priory founded in 1107. The industries include brush-making and brewing. Pop. reg. dist. (1911) 7,937.

Wynants, or WIJNANTS, JAN (1615-79), chief representative of the Dutch school of landscape painting, born in Haarlem. Philip Wouwerman and Adriaen van de Velde were pupils of Wynants, and many works attributed to him are probably by Jan Wouwerman.

Wynberg, health resort, on S.E. slope of Table Mt., Cape of Good Hope, 8 m. S.E. of Cape Town, is in a wine district (Constantia). Pop. 19,000.

Wyndham, SIR CHARLES (1841), English actor; made his first appearance (1862) on the stage at Washington, U.S.A., playing with John Wilkes Booth. Returning to England he made his first London appearance (1865) in *All that Glitters is not Gold*. He returned to America (1869), and appeared at Wallack's theatre as Charles Surface, one of his greatest impersonations. It was at the

Court Theatre, in 1874, that he made his first big hit in *Brighton*, a version of his brother-in-law's (Bronson Howard) *Saratoga*. He next took over the management of the Criterion Theatre (1876), where he has produced *Pink Dominoes*, *Truth*, *Betsy*, *Where's the Cat?* *Butterfly Fever*, *Fourteen Days*, *Featherbrain*, *The Candidate*, *Wild Oats*, *Still Waters Run Deep*, *The Headless Man*, *David Garrick*, *She Stoops to Conquer*, and *The Bauble Shop*.

Wyndham, GEORGE (1863), English politician, born in London, has sat for Dover since 1889. In 1898 he succeeded Mr. Brodrick as under secretary for war; on the reconstruction of Lord Salisbury's third ministry in November 1900, he was appointed chief secretary for Ireland. In July 1902, on the formation of Mr. Arthur Balfour's government, he was retained in this position, and admitted to the cabinet. In March 1905 he resigned owing to the MacDonnell controversy as to devolution. He wrote *The Development of the State* (1904), edited *The Poems of Shakespeare* (1898), *North's 'Plutarch'* in the *Tudor Classics*, and *Ronsard and 'La Pléiade'* (1906). See DUNRAVEN.

Wyndham, ROBERT HENRY (1814-94), Irish actor, was born in Dublin, and made his first appearance on the stage at Salisbury (1836). In 1844 he was *jeune premier* at the Adelphi in Glasgow, and in 1845 made his début in Edinburgh, with which he was afterwards prominently associated as an actor-manager. Among his earlier parts were Mercutio, Charles Surface, and Rashleigh Osbaldistone in *Rob Roy*. He had the misfortune to have three theatres burned under his management. He retired from the stage in 1877.

Wynkyn de Worde. See WORDE.

Wyntoun, ANDREW OF (?1350-?1420), Scottish chronicler, was (1395) prior of St. Serf's Inch, Loch Leven. He wrote *The Orygynale Cronykle of Scotland*, of value, historically, because of its relative accuracy; and philologically, as showing the close connection of the dialect of southern Scotland in the time of Wyntoun with that of northern England. The *Chronicle* was published by Macpherson in 1795, by Laing in 1872 (in *Scottish Historians Series*), and was issued by the *Scottish Text Society* (bk. iv. 1906).

Wyoming, one of the western of the United States of America, lying between lat. 41° and 45° N., and long. 104° 3' and 111° 3' W., with an area of 97,914 sq. m., of which 320 sq. m. are water. It was organized as a territory in 1868, and admitted as a state in 1890. Most of the area is a plateau, with a mean altitude of 6,700 ft. Into the north-western part project ranges of the Rocky Mts., including the Teton and Wind River ranges, with peaks exceeding 13,000 ft. in altitude, the highest being Frémont (13,790 ft.); and farther E. the Big Horn range, of nearly equal height. In the southern part of the state these ranges reappear as the Park, Medicine Bow, and Laramie ranges. It contains the sources of the Green, Snake, Madison, Yellowstone, and Platte Rs. Except on its mountain ranges, Wyoming has a rainfall less than twenty inches annually. Irrigation is almost everywhere necessary. Farming consists in great part of pastoral pursuits. In the number of sheep the state is exceeded only by Montana. Manufactures are as yet of little moment, but in the mining of coal Wyoming is of great and increasing importance, the production in 1908 being 5,489,902 short tons. In the same year 2,416,197 lbs. of

copper were produced. The University of Wyoming at Laramie had 300 students in 1910. Pop. (1910) 145,965. The chief cities are Cheyenne, the capital, and Laramie. See Raine's *Wyoming* (1909), and *The State of Wyoming* (1908, official).

Wyoming Valley, picturesque valley, 23 m. long by 3 m. broad, along the N. branch of the Susquehanna, Luzerneco., N.E. Pennsylvania, U.S.A.; has deposits of anthracite coal. The massacre which forms the subject of Campbell's poem took place on July 3, 1778.

Wyss, JOHANN RUDOLF (1781-1830), Swiss man of letters, born at Bern, where he spent all his days as professor of practical philosophy and curator of the museum and library. He was the author of the *Swiss Family Robinson* (1812-13). He also edited a collection of Swiss legends and folklore tales (*Idyllen und Erzählungen aus der Schweiz*, 1815-22).

Wytttenbach, DANIEL ALBERT (1746-1820), classical scholar, born at Bern in Switzerland. Ruhnken invited him to Leyden (1770), and obtained for him a chair in the college of the Remonstrants at Amsterdam (1771), whence he was transferred to the University of Amsterdam (1779), and in 1799 to Leyden, as successor of Ruhnken, whose life he wrote in Latin (1800). His success as a teacher was very great, and he deserves to rank with Hemsterhuis, Valckenaer, and Ruhnken as an exponent of Dutch classical scholarship. He edited Plato's *Phædo* (1810), and Plutarch's *Moralia* (1795-1820), also a few Greek texts, but his real work was done in the *Bibliotheca Critica* (1777-1808). See *Life* by Mahne (1823).

Wyvern, or WIVERN, in heraldry, a device representing a monster, whose fore part is that of a dragon with legs and wings, and whose hinder part is in the form of a serpent with barbed tail.

X

X. In some of the early Greek alphabets this sign has the value *ks*; in others its value is *χ*, spirant *k*. The value *ks* was transmitted to the Latin alphabet; the value *χ* was perpetuated in the standard Greek alphabet. It is possible that the sign had not the same origin in the two cases; in neither has the history of its origin been definitely established. *Samech* is conjectured to be the Semitic original of Latin *x*. *X* may have been differentiated from the Italian representative of *samech*, for the proper place of that letter is the fifteenth, and there was an obsolete sign in the fifteenth place of the early Italian alphabet. The form of early Semitic *samech* is that of Greek *Ξ*, with the addition of a connecting stroke down the middle. Hebrew *צ* is quite a transformation of the original. The name means 'support.' It is the same word as the Greek 'sigma.' The Greeks changed the name of *Ξ* when they changed its value. The name 'sigma' was in this way set free, and was transferred to the letter which the Semites called 'shin.' (See *S.*) The sound of *x* is very unstable. In Latin it tended to become *s*. In English the letter is uncommon. It is sometimes pronounced *gz* ('example') and *z* at the beginning of words originally Greek (Xenophon). Other sounds also are represented by it in other modern alphabets—*c.g.* French and Spanish.

Xanthi (Turk. *Eskije*), tn., Turkey, vilayet of and 95 m. w.s.w. of Adrianople, on the *Eskije*; is noted for tobacco. Pop. 14,000.

Xanthine, $C_5H_4N_4O_2$, a nitrogenous compound, closely allied to uric acid, that occurs in extract of meat and in tea. It forms a colourless powder slightly soluble in water, and yields alloxan and urea on oxidation.

Xanthippus, of Athens, father of Pericles; in 490 B.C. prosecuted Miltiades for his failure in the Parian expedition; in 484 he was ostracized, but was recalled when Xerxes invaded Greece in 480; and in 479 commanded the Athenians at the victory of Mycale. For some years subsequently he was one of the chief democratic politicians at Athens.

Xanthoxylum, a genus of shrubs and trees belonging to the order Rutaceæ. They bear cymes of usually small, white, or greenish flowers, followed by aromatic fleshy fruits. They mostly require greenhouse treatment in the British climate.

Xanthus, chief city of Lycia, stood on w. bk. of river of same name, 7 or 8 m. from its mouth. Twice in antiquity it endured sieges, which the inhabitants ended by destroying themselves and their property—first by the Persians under Harpagus (545 B.C.), and secondly by the Romans under Brutus (43 B.C.). Its ruins were explored by Sir C. Fellows. See Fellows's *Discoveries in Lycia* (1841).

Xantippe. See *SOCRATES*.

Xavier, FRANCIS (1506–52), apostle of the Indies, was born near Sanguesa in the north of Spain. In 1534 he became associated with Loyola in the foundation of the Society of Jesus. John III. of Portugal sought for agents to go and Christianize the Portuguese colonies in India.

Xavier was chosen, and landed at Goa on May 6, 1542. His first work was the revival of practical Christianity among the Europeans of Goa. His method was to teach the Creed, the Commandments, and the Lord's Prayer, and to baptize those who gave their assent to these formularies. Thirty churches were speedily organized near Cape Comorin. In Travancore Xavier baptized ten thousand of the natives. He then visited Malacca, the islands of Banda, Amboyna, and the Moluccas. In 1549 he landed in Japan, where he speedily won some adherents. At Amanguchi (Yamaguchi) he is said to have baptized no less than three thousand persons. Xavier then returned to Goa to plan a mission to China, but died of fever before he could carry out his purpose. He was canonized by Gregory xv. in 1622. His festival is on the 3rd of December. See *Life*, by H. J. Coleridge (1873).

Xebec, a small sharp-built, three-masted vessel, with lateen sails, used for coasting voyages in the Mediterranean and on the ocean coasts of Spain and Portugal. It differs from the felucca in possessing both square and lateen sails, the felucca having only the latter rig. The xebec was formerly much used by Algerine pirates.

Xenia, the changes produced in the seeds of some plants which have been fertilized with the pollen of another species or variety. In Professor Correns's experiments on different races of maize it was found that, when the yellow-skinned race was fertilized from plants of the race yielding violet-skinned grains, the pollen was prepotent, and a large proportion of the grains had a violet skin. See C. Correns's *Bastarde zwischen Maisrassen* (1901).

Xenia, city, Ohio, U.S.A., co. seat of Greene co., 50 m. N.E. of Cincinnati; manufactures twine, paper, and powder. Here is Wilberforce University. Pop. (1910) 8,706.

Xenocrates (396-314 B.C.), of Chalcedon, Greek philosopher, was first a pupil of Æschines, and then of Plato, whom he accompanied (361) to Syracuse. He succeeded Speusippus as president of the Academy in 339 B.C. In philosophy, especially ethics, he followed Plato, though his theories as to number resembled Pythagorean doctrines. See Zeller's *Plato and the Older Academy* (Eng. trans. 1876).

Xenon, Xe, 128, is the heaviest and rarest of the elementary gases of the argon family present in the atmosphere, in which it occurs to the extent of about one part in twenty millions. It was discovered by Sir William Ramsay in the residue left on evaporating liquid air, and is chemically quite inert. When sparked in a vacuum tube it is marked by a characteristic blue glow, which changes to green on the introduction of a Leyden jar, and shows distinctive lines in the spectrum.

Xenophanes (c. 576-480 B.C.), of Colophon in Asia Minor, founder of the Eleatic philosophy; left Colophon at the age of twenty-five, and after years of travel in Greece settled at Velia (Elea) in S. Italy. He expressed his views in poetry, particularly noticeable in his condemnation of the anthropomorphism of Homer and Hesiod. His doctrine was that God is the One; that His existence is characterized by unity and immutability; and that the universe is permeated by this divine unity. His followers were Parmenides and Zeno. He wrote both elegiac poems and a work on nature in hexameter verse. For the extant fragments see Bergk's *Lyrici Græci* (ed.

1900), and for his philosophy Burnet's *Early Greek Philosophy* (1892) and Gomperz's *Griechische Denker* (Eng. trans. 1905).

Xenophon (c. 430-355 B.C.), Greek prose writer, was a native of Athens and a pupil of Socrates. In 401 B.C. he joined the expedition of Cyrus the Younger, and has told the story of it in his *Anabasis*. When the Greek officers were murdered through the treachery of the Persian satrap Tissaphernes, Xenophon brought the Greek troops safely to Trapezus (Trebizond), on the Black Sea. When they were taken into Lacedæmonian pay Xenophon left them, and returned to Athens. Soon afterwards he was banished, probably because of his Spartan sympathies. Eventually he settled at Scillus, near Olympia; but about twenty years later the Eleians expelled him, and he retired to Corinth. In 369 his banishment was revoked. His historical works include the *Anabasis*, distinguished by the simplicity and candour of its style; the *Hellenica*, which not only concludes Thucydides's history of the Peloponnesian war, but also deals with Greek history down to 362 B.C. (it is of great value, but shows a strong bias in favour of Sparta); and the *Agésilas*, a panegyric on the Spartan king of that name. The works relating to Socrates are the *Memorabilia*, a defence of Socrates against his accusers, exhibiting the practical Socrates, not the ideal Socrates of Plato; the *Apology*, Xenophon's account of Socrates's defence at his trial; the *Œconomicus*, which gives Socrates's views on the practical business of life, especially on the relations and duties of husband and wife; and the *Symposium*, which describes a banquet at Athens, with Socrates as the central figure. The essays on political philosophy are a tractate, *On*

the Constitution of the Lacedæmonians, which, however, rather describes the Spartan training; the *Hiero*, a dialogue between that ruler and the poet Simonides on tyranny; the *Cyropædia*, a sort of historical romance founded on the career of the great Cyrus; and the treatise *On Athenian Revenues*, a practical handling of the resources of the state, dating probably about 356. The work ascribed to Xenophon, *On the Athenian Constitution*, is clearly not his. Xenophon's technical tracts are three in number—the *Hipparchicus*, on the duties of a cavalry officer; *On the Horse*, remarkable for its practical sense and the humanity of the methods of training which it recommends; and *On Hunting*, which treats of the breeding and training of dogs, of nets, and of hare-hunting. As a writer, Xenophon is possessed of great simplicity and ease. The language of his writings is Attic, but combined with a number of words from other Greek dialects, Ionian and Dorian. In fact, he was the earliest writer of what is known as the 'common dialect' of Greek, which eventually spread over the Eastern world, and from which modern Greek is derived. Editions: Schneider (1838-40), Sauppe (1864), L. Dindorf (1873), Schenkl (1876); separate works, with notes, *Anabasis*, by Pretor (1888); *Cyropædia*, by Holden (1887-90); *Hellenica*, by Keller (1890), bks. i. and ii. by Underhill (1888); *Hiero*, by Holden (1883); *Memorabilia*, by Marshall (1890); *Œconomicus*, by Holden (1895); *Symposium*, by Winans (1881); English translation, by Dakyns (1890-4).

Xenotime, phosphate of yttrium. A rare tetragonal mineral, which occurs in the muscovite-granites of Brazil. See MONAZITE.

Xeres. See JERÉZ DE LA FRONTERA.

Xerophytes. See PLANTS.

Xerxes, king of ancient Persia from 485 to 465 B.C., was the eldest son of Darius, whom he succeeded. Immediately upon his accession he began to make preparations for the invasion of Greece. Two of the greatest works performed were the cutting of a canal through the isthmus of Mt. Athos and the bridging of the Hellespont. Xerxes accompanied his forces on their march through Thrace, Thessaly, and Locris, witnessed the battle of Thermopylæ, then advanced through Phocis and Bœotia into Attica, and from the Attic coast beheld the destruction of his fleet at Salamis. He then retired with great speed into Asia (480 B.C.). In 465 he was murdered by two of the officers of his court; he was succeeded by his son Artaxerxes. See Grundy's *Great Persian War* (1901), and *Herodotus*, lib. vii.

Ximenez de Cisneros, FRANCISCO (1436?-1517), Spanish cardinal and statesman, born at Torrelaguna, Castile. He lived in Rome as consistorial advocate (1464-72). When Ximenez took possession of the archpriesthood of Uceda, under the papal grant, he was imprisoned by the archbishop of Toledo, and remained in prison six years. Then he exchanged his benefice for that of canon-general of Sigüenza under Cardinal Mendoza, whose chaplain he was (1480). When Mendoza was made archbishop of Toledo (1483) Ximenez followed him, and entered the Franciscan order. He became famous in the order for austerity and piety, and when, in 1492, Queen Isabella's confessor Talavera was made archbishop of Granada, Mendoza recommended Ximenez to succeed him. He was stern, bigoted, and strong, and his

personal rectitude and piety gave him great influence over the queen. On the death of Mendoza (1495) she insisted upon making Ximenez archbishop of Toledo, in opposition to the wishes of Ferdinand and of Ximenez himself. He was a drastic ecclesiastical reformer, and reformed the scandalous corruption of the monastic orders. To Ximenez is mainly due the establishment of the Spanish Inquisition (of which he was chief) as a political force. Ximenez founded and splendidly endowed the University of Alcalá (1499-1508), and there established his famous study for translating, collating, and printing the great 'Complutensian' polyglot Bible. On Isabella's death (1504) Ximenez became chief minister to Philip I. and Juana, the new sovereigns of Castile, and is believed to have had a hand in Philip's death by poison in the next year (September 1506). He was made cardinal in 1507; but Ferdinand distrusted him, and during his absence upon an armed expedition to conquer N. Africa for Castile at his own expense he was disgraced, and retired to privacy at Alcalá (1509). On Ferdinand's death (1516) Ximenez again ruled Castile as regent, for nearly two years, on behalf of Charles I. The latter, as ungrateful as his grandfather, disgraced and dismissed his great minister on his arrival in Spain, and Ximenez died broken-hearted. See Gomez de Castro's *De Rebus Gestis Francisci Ximenii* (1569), and *Lives* by Hefele (Eng. trans. 1860), Ulrich (1883), and C. Navarro Rodrigo (1869).

Xisuthros. See DELUGE.

Xochimilco, tn., of the federal district of Mexico, on Lake Xochimilco, 12 m. s.s.e. of Mexico city, on the site of an important Aztec town. Pop. 11,000.

X Rays. See VACUUM TUBES.
X Rays in Medicine and Surgery. The physics of X rays are described under vacuum tubes. The amount of absorption which the rays undergo in passing through any substance is proportionate to its density, and this property of the rays has proved of the highest importance in surgery and medicine. The practical importance of this subject may be learned from the fact that medico-legal cases have been raised, in which claims have been made against the medical men for neglect in not having made use of X rays as an essential aid in diagnosis in certain cases of bone injury. The information given by the X rays in doubtful cases of bone injury, dislocation of joints, and the like, is so precise and valuable that their use is called for as a routine measure in all doubtful cases. The shadows cast by the bony structures are so pronounced that very accurate representations are given of the relative positions of normal, fractured, or diseased bones. While the bones of the extremities are more easily defined, it is usually possible to get equally accurate pictures of the more deeply-seated bones in the spinal column, a fact of great value in doubtful cases of fracture of the spine. Apart from bone injury and disease, probably the greatest value of the X rays to the surgeon is seen in genito-urinary surgery. Most forms of urinary calculi are opaque to the rays, and these can now frequently be detected with the greatest precision in the kidney, ureter, or bladder. By means of the X rays it is now possible to make diagnoses which exclude such diseases as gall-stones, appendicitis, and other disorders, the symptoms of which may in some cases very closely resemble those

of renal colic. Röntgen rays are also of very great value to the physician. The action of the heart can be seen and studied by means of the photographic screen, and any evidence of enlargement or displacement is revealed. The existence of an aneurism of the aorta is frequently revealed by the use of the screen when other methods of examination have entirely failed. Within the last few years the field of usefulness of the X rays in the diagnosis of gastro-intestinal disorders has enormously increased. By the use of bismuth test vessels it is now possible to localize the seat of obstruction in the bowel, to map out the size of the stomach, and to trace the rate of movement of the intestinal contents in a manner of the greatest value in the diagnosis of a large number of common and serious diseases. The X rays are also of use to the physician in determining the existence and extent of bony diseases in cases of rheumatism, gout, and rheumatoid arthritis.

Xylenes, or **XYLOLS**, the three isomeric dimethyl-benzenes, $C_6H_4(CH_3)_2$, occurring in coal tar. They are very similar to benzene, though of higher boiling-point (138-143° C.), and are used as the sources of some dye-stuffs.

Xylol. See **XYLENES**.

Xylonite. See **CELLULOID**.

Xylophaga, a general term for some groups of insects which bore into and feed on wood. See **BOREERS** and **WEEVIL**.

X.Y.Z. Correspondence, a term applied in the history of the United States to a series of letters written to President Adams by three American commissioners who had been dispatched to France—Marshall, Pinckney, and Gerry—to secure the friendship of Talleyrand, whose demands were altogether unacceptable.

Y

Y. This letter is the Greek form of U. It was first adopted by the Latin alphabet in the form of V, with a distinctive Latin value. In the 1st century B.C. it was again borrowed, but this time for use in Greek words, in the form Y and with a Greek value. It is, therefore, properly a vowel. In Early English it had approximately the value of *u* in French 'lune.' After the Norman conquest, under French influence, *u* took the old value of *y*, and *y* became confused with *i*. As an English vowel *y* is now interchangeable with *i*, except that *y* is preferred at the end of words, and to represent Greek Y. The use of *y* as a consonant, as in 'yard,' is practically peculiar to English. It is here a substitute for *g*, owing to the resemblance of the written letters *g* and *y* (Ellis). (See G.) The English *y* has another consonantal value, now almost obsolete: it is occasionally used to express *th* (ye). In this case also it is a substitute for another sign, Early English þ. For the early history of *y*, see U.

Yablonoi, a mountain system of S.E. Siberia, extending from the s. of Transbaikalia, 1,000 m. E.N.E., until it merges in the Stanovoi Mountains. Its highest point is Mount Sokhondo (8,040 ft.), near the s. extremity, in about 50° N. lat. and 111° 26' E. long.

Yachow-fu, walled city, Szechuen prov., China, on the Ya, 190 m. W.N.W. of Chung-king; has a large tea industry. Pop. 40,000.

Yacht. Yachting as a pastime may be said to date from 1720, when the Water Club of the harbour of Cork was founded; but

not much progress was made until the foundation of the Royal Yacht Club, which was first formally constituted in 1815, though it had been in embryo for some years. It received permission to add the term 'Royal' in 1820, and in 1833, by the king's express desire, became the Royal Yacht Squadron. Popularity, however, came before 1843, when Queen Victoria took an interest in the sport by the offer of cups for competition. In 1846 yacht racing had secured a strong hold in the United States, and several new types of vessels were evolved. The yacht *America* crossed the Atlantic in 1851 to compete at Cowes, and in a race for a cup presented by the Royal Yacht Club was successful in transporting the cup to the United States, where it has since remained. (See AMERICA CUP.) Since then almost every year has seen improvements alike in design and build. Sailing yachts may be broadly divided into two classes—cruising and racing. The modern cruisers have been built specially with a view to comfort and good sea-going qualities. Many yacht-owners have built steam vessels, of very large power and dimensions, the recent ones having mostly twin screws and triple-expansion engines, and being capable of a speed of 16 or 17 knots. In the early days of yachting racing yachts were ordinary small coasting vessels; but the desire for speed led in time to the building of vessels specially adapted to this end. In order to put the various sized yachts on a somewhat equal footing, measurement rules were adopted, and the design of a racing yacht im-

mediately narrowed itself down to the question of getting the biggest possible boat on the smallest possible measurement. Under the old tonnage rule, where breadth was very heavily taxed and sail area not measured at all, the vessels were extremely narrow and had large sail-spread. To enable them to carry the large sail, heavy keels were fitted at a great depth, and the vessels had a very large displacement. But a new rule was introduced (1897), in which length and sail area alone were taken into account. The removal of the tax on beam immediately caused vessels to become very much broader than they had been before. The type of vessel produced under this rule had large sail area, great breadth and draught, with the smallest possible displacement, very hollow floors and long overhangs forward and aft, making her a very indifferent sea-boat, but undoubtedly fast in light and moderate weather. In order to correct this the present measurement rule has been introduced, which taxes any hollowness of the floor or in the profile of the vessel. Some of the yachts which were built to compete for the America Cup were constructed of steel, with a lead keel run into the bottom of the vessel; others were of composite construction, having steel frames and wood planking. The rating rule under which these vessels are measured takes account only of length and of sail area, so that the vessels are generally of the type evolved under the old British rule in respect to the hollow floor and long overhangs, with considerable breadth and draught. The length (for cutters) is limited by the rule to 90 ft. The vessels being designed purely to obtain the maximum speed, weight has been cut down as far as is consistent with the necessary

strength. This has been done by employing nickel steel, tin bronze, manganese bronze, plough steel wire (for rigging), while the ballast is invariably of lead. A noticeable feature of this contest is an entire disappearance of the centre-board, which at one time was typical of American vessels, both contestants having become keel cutters. Indeed, so like one another have the yachts become that the result of a contest is almost beyond the control of the designer or builder of the vessel—a slight error of seamanship or fluke in the weather making a far greater difference in the result than anything due to the design or construction of the yachts themselves. For other than racing purposes steam has now taken the place of sails in cruising yachts.

Measurement Rules.—The early measurement rules involved the product of length multiplied by square of breadth, giving a volume or quantity of *three* dimensions, and generally expressed in units called tons. When sail area was introduced as a factor, together with the length of the vessel, the rating became a linear or 'one dimension' quantity, and was most conveniently expressed in feet. The present Y.R.A. rating rule is length on water-line plus breadth, plus '75 times the chain girth taken at '6 of the length from fore end of water-line, plus 4 times the difference between the chain girth and the true girth (this being to penalize hollow floors), plus '45 times the square root of the sail area and the sum divided by 21. All the above dimensions being taken in feet and decimals thereof, the result is a quantity expressed in feet. The rating rule under which the America Cup contests are carried on is length plus square root of sail area, divided by two,

which again is a quantity of one dimension, all sizes being taken in feet and decimals thereof. See Clark's *History of Yachting* (1904), Smyth's *Mast and Sail in Europe and Asia* (1906), Young's *Yacht Management* (1904), Kemp's *Yacht Sailing* (1904), Stephen's *American Yachting* (1904), the *Works of H. C. Folhard* (1901), *Yachting*, by Lords Brassey and Dunraven, 'Badminton Library' (1890), and *British Yachts and Yachtsmen* (the 'Yachtsman's' Pub. Co., 1907).

Yacht, ICE SAILING, a form of yachting practised chiefly on the ice of the Hudson R. in America, and on the Gulf of Finland. An ice yacht differs little from an ordinary yacht. The sails and manipulation are the same; but instead of having a keel, the ice yacht possesses what is called a 'runner plank'—either rigid or flexible—which runs athwart ship, and on which rests the whole superstructure. The bottom frame is in the form of a kite or cross—two strong timbers placed at right angles, with an after runner, which serves the double purpose of runner and rudder. Timber and bowsprit are trimmed down and firmly bolted together, forming the long backbone of the yacht. Upon the after end of the timber is fitted a shallow elliptical box, provided with cushions, upon which the helmsman and passengers sit or lie. The framework is held in position by four steel wire stays, running from the end of the bowsprit and centre timber to near the ends of the runner plank, starboard and port. A fully-equipped ice yacht in a good wind can do a mile in a minute.

Yahveh, or JAHVEH. See JEHOVAH.

Yājñavalkya, Hindu sage, founder of the Vajasaneyins, or White Yajus, and the author of the *Satapatha-brāhmaṇa*. He

spent some time at the court of King Janaka of Vidcha (Tirhut)—i.e. Muzaffarpur in Bengal. He wrote also the *Yajnavalkya Dharmasastra* (ed. with German trans. by Stenzler, 1849), a treatise on law, consisting of three books—the rule of conduct, the civil and criminal law, and penance or expiation.

Yak (*Bos grunniens*), a member of the ox genus, found on the high plateau of Tibet, and in the neighbouring parts of Central Asia, where it occurs alike as a domesticated and as a wild animal. The most notable peculiarity is the heavy fringe of long hair which occurs at the sides of the body, extending up to the shoulders in front and over the thighs behind. The tail also bears an enormous tuft of long hair, and there is a similar tuft on the breast. The wild yak is dark brown in colour, and an average bull stands 5 ft. 6 in. at the shoulders; but in domestication there is much variation as regards colour, size, and the texture of the coat. The domesticated form is kept for the sake of its milk and flesh, and also on account of its use as a beast of burden. Intolerant of heat, the wild yak is very resistant to cold, and is found in the summer time at altitudes of from 14,000 to 20,000 ft. above sea-level.

Yakoba, or YAKUBU, tn., Northern Nigeria, 140 m. S.S.E. of Kano, is the chief town of the native state of Bautshi. It manufactures cotton, and has a large trade. Pop. 50,000.

Yakub Beg. See KASHGAR and TURKESTAN (CHINESE).

Yakub Khan. See AFGHANISTAN.

Yakuts, a Ural-Altaic people of the Turki stock, inhabiting the Siberian province of Yakutsk, and numbering about 245,000. To some extent they are nomadic, but their usual dwelling is the

wooden *yurt*, with sloping, turf-clad walls. For more than a century they have been nominally members of the Orthodox Greek Church; but as a matter of fact they are still Shamanists. They live in communities or scattered groups, and are strictly exogamous, a marriage between two people of the same group being almost quite unknown. It is believed, however, that endogamy was the rule among them in ancient times. Sieroshevski, a Polish exile, who spent twelve years among the Yakuts, gives an exhaustive account of these people (*Yakuty*, 1896), an English abridgment of which was contributed by Professor Sumner of Yale to the *Journal of the Anthropological Institute of Great Britain and Ireland* (1901). See also J. Stadling's *Through Siberia* (1901).

Yakutsk. (1.) Province, Siberia, extends from the Anabara R. on the w. to the Stanovoi range on the E., and southwards to the Vitim R. and the Yablonoi range. From the Stanovoi range, which in its southern part exceeds 7,500 ft., the country sinks northwards to the Arctic Ocean in the form of plateaus and ranges of mountains separating the river valleys. Of these rivers the Lena is by far the largest; it is the chief channel of communication. East of it lie the Yana, Indighirka, and Kolyma; westwards, the Olenek and Anabara. Lakes are very numerous, especially in the plain between the Indighirka and Kolyma. Forest covers a large part of the surface, extending up to 69° or 70°, and leaving a strip of tundra along the shore of the ocean. The climate is of remarkable severity, lower temperatures being recorded (down to -80° F.) at Verkhoyansk than were experienced by Nansen in the Polar regions, and the ground being always frozen to a depth of three or four feet.

Nevertheless, and in spite of the small precipitation—the summer rainfall not exceeding eight inches—cereals are grown, chiefly rye and barley. Cattle-grazing and horse-breeding are the chief occupations of the settled inhabitants in the south—Yakuts and Russian settlers—while the Tunguses and Chukches possess herds of reindeer, hunt, fish, and collect mammoths' tusks. The sable has been nearly exterminated, and the skins now obtained are chiefly squirrel, ermine, and fox. Gold is extracted principally from the placers of the Olekma and Vitim. Coal is found near Shigansk on the Lena, and there are seams on the Vilyu and Kolyma; galena, copper, and iron also exist. Yakutsk is the chief town. Area, 1,533,400 sq. m. Pop. 310,000. (2.) Town, cap. of above prov., Siberia, 1,150 m. N.E. of Irkutsk, on l. bk. of Lena. It consists chiefly of houses of wood or mud, built on a marshy alluvial plain. It is a convict station, and the residence of the bishop of Yakutsk and Vilyuisk. Pop. 7,300.

Yalding, par. and vil., Kent, England, 5 m. s.w. of Maidstone. Hops and fruit are largely grown. Pop. (1911) reg. dist. 7,621.

Yale, ELIHU (1648-1721), governor of Madras, was born near Boston, Massachusetts, but was brought to England in 1652. In 1672 he entered the service of the East India Company, and became governor of Madras (1687-92). He was suspended in 1692 because of high-handed conduct, but was made governor of the East India Company in 1699. In 1718 he helped to endow the college (now university) which bears his name. He also left to it a large sum of money.

Yale University, an institution in the United States, chartered as the Collegiate School of Connecticut in 1701. The college

was first established at Saybrook, but was removed to New Haven in 1717, and the name of Yale College was adopted in honour of Elihu Yale, who had made large gifts to the school. A new charter was obtained in 1745, and in 1887 the title of Yale University was authorized by the legislature. In addition to the academic department, Yale has schools of philosophy, of medicine (founded 1812), of theology (Congregational, founded 1822), of law (1824), the Peabody Museum of Natural History, the Sheffield Science School (1847), and the School of Fine Arts (1864). The library contains over 600,000 volumes. The students (1910) numbered 3,287.

Yalta (anc. *Jalita*), seapt. and winter resort, Taurida gov., in the Crimea, Russia, 61 m. E.S.E. of Sebastopol, on S. slope of Yaila Mts. Mean temp. of year, 57° F. Pop. 15,000.

Yalu, riv., Korea, rises in Paiktu-San, falls into Korea Bay, its course forming the boundary between Korea and Manchuria. Rich forests clothe the mountains in its upper basin; large quantities of timber are floated down to Wi-ju, and thence shipped to China. Length, 300 m. The river is navigable to Wi-ju. For the battle of Yalu see HAI-YUN-TAU and RUSSO-JAPANESE WAR.

Yam, the name given to certain tropical plants belonging to the genus *Dioscorea*. They are extensively cultivated in China and in the W. Indies. They are grown for their roots or rhizomes, which are cooked and eaten as a vegetable. *D. batatas* is difficult to grow, as its roots go so deep into the soil. Its thin, trailing stems attain a height of from six to nine feet, the growth being not unlike that of the black bryony of British hedgerows. The rhizomes of *D. decaleneana* are more like potato tubers, and they do not require so deep a soil. This

last was introduced into France in 1854, and it is also largely grown in S. Africa. Reproduction is from the tubers. These produce their trailing stems, which, when strong enough, are made into cuttings and planted in ridges. There are several varieties of Chinese yams. A trench from 10 to 15 ft. long will often produce enough roots to keep one man a whole year. The plants are also propagated from seed. The tubers average from fourteen to twenty inches long. Having been peeled and washed, yams may be boiled as potatoes; or they may be baked in a hot oven.

Yama, in Hindu mythology, the god of the dead, who judges and punishes souls. He is represented as of a green colour, four-armed, clad in garments of fire, crowned, and seated on a buffalo. He holds a mace and noose, and drags the souls of the condemned out of their bodies to the judgment-seat. In the *Atharva-Veda* and *Rig-Veda* he is represented as the first mortal to die, and as thus showing to men the road to the other world.

Yamagata, tn., Japan, in prefecture of Yamagata, 170 m. N. by E. of Tokyo. Pop. (1908) 42,234.

Yamagata, ARITOMO, PRINCE (1838), Japanese marshal and statesman, was born in the province of Choshu, Hondo. After the civil war (1868), in which he commanded the troops in the province of Echigo, he visited Europe (1870), and on his return to Japan advocated universal military service. To him is due the completion of the organization of the Japanese army, of which he is now chief of the general staff. In the war with China (1894-5) he was appointed to the command of the First Army Corps, and obtained a decisive victory at Pingyang, and was about to march on Mukden, when he had to return to Hiroshima on account of ill

health. In 1898 he was made prime minister, and in 1905 president of the Privy Council. He was created marquis and marshal of the empire. In 1906 he received the Order of Merit from King Edward, and in 1907 was exalted to the title of prince.

Yamboli, or JAMBOLI, tn. in E. Rumelia, Bulgaria, 55 m. N. by w. of Adrianople. Pop. (1910) 15,954.

Yamethin, chief tn. of Yamethin dist., Upper Burma, 250 m. N. of Rangoon. Pop. 9,000. The district has an area of 4,255 sq. m. and a pop. of 243,000.

Yanaon, French enclave in E. Madras, India, on l. bk. of Godavari, near its mouth, 83 m. N.E. of Masulipatam; covers an area of 5 sq. m. Pop. 5,000.

Yanbu, or YEMBO, seapt. of Hejaz, Arabia, on Red Sea, 125 m. w.s.w. of Medina, of which it is the port. Pop. 5,000.

Yang-chow-fu, walled city, Kiangsu prov., China, on the Grand Canal, 35 m. N.E. of Nanking. Pop. 100,000.

Yang-tse-kiang, riv., China, is estimated to drain a basin of 680,000 sq. m., and to discharge 770,000 cub. ft. of water per second into the Yellow Sea. Its length is estimated at nearly 3,500 m. Its sources lie a considerable distance apart, in lat. 33°-36° and long. 90° E., between the Tang-la and Kuenlun Mts. There the Murui-usu and the Chumar or Napchitai-ulan-muren unite in lat. 34° 43', alt. 13,146 ft., and form the Dichu or Drechu, which bends s.e. through deep gorges; below Batang, as the Kin-sha-kiang, or River of Golden Sand, it is the boundary between Tibet and China. Above Li-kiang it turns sharply N.E. to Yun-ning, and after describing almost a complete circle descends close to lat. 26°, and then turns N.E., receives the Ya-lung on its l. bk., and follows a course deep in the

mountains, until at Ping-shan it at last leaves the ravines for a while and (1,726 m. from Shanghai) becomes a navigable river. On the left the Min, Lo, and Kia-ling, on the right the Hêng, Chi-shin, and Kien-kiang add their waters before, near Kuei-fu, it enters the last series of gorges. Quitting these above Chang, it receives through the Tung-ting Lake the drainage of the province of Hu-nan, and at Hankow, to which ocean steamers ascend in summer, the waters of half of the provinces of Shen-si and Hu-peh, and enters an alluvial plain. Below Kiu-kiang the Poyang Lake empties into it the waters of the Kiang-si. In An-hui it becomes a tidal river, and in Kiang-su forms the chief strand in the network of canals. See Blakiston's *Upper Yangtze* (1865); Charles, in *Geographical Journal* (Sept. 1898); and Mrs. Bishop's *The Yangtze and Beyond* (1899).

Yanina. See JANINA.

Yankee, said to be an Indian corruption of English or Anglais. It was derisively applied by the British soldiers to the New Englanders during the revolutionary war (1775-82), and later by the Confederates to the Federals during the civil war (1861-5). The word is now indiscriminately used in Europe to denote the people of the United States.

Yankee Doodle, an American national air. It is generally considered to be an English tune introduced into America by the British troops about 1775, the words of which were written by Dr. Schuckburgh, a surgeon in the army of Lord Amherst during the French and Indian wars (1755-63). The air was first printed in Arnold's opera, *Two to One*, in 1784.

Yankton, city, S. Dakota, U.S.A., co. seat of Yankton co., on l. bk. of Missouri, 60 m. N.W.

of Sioux city. Here is Yankton College (351 students in 1910). Pop. (1910) 3,787.

Yap, GUAP, or EAP, an isl., and the seat of administration, of the W. Caroline Islands, Pacific Ocean. Pop. 7,200.

Yapock. See CHIRONECTES.

Yapura, JAPURA, or CAQUETA, riv., Colombia and Brazil, rises in the Andes, near Popayan, and flows E.S.E. and S.E. 1,700 m. to join the Amazons on the left bank. It is navigable by steamers for 970 m.

Yaracuy, a N.E. state of Venezuela. Pop. 86,000. The cap. is San Felipe.

Yard, the British standard of measure, equal to three feet or thirty-six inches. The exact measure is indicated by the length between two marks on a metal rod embedded in the masonry of the Houses of Parliament, and of the Royal Observatory, Greenwich, a copy being also held in the Standards Office. Chisholm, the warden of the standards, traced the yard back to the Egyptians and Hebrews. As a cloth measure the yard is divided into four quarters, or sixteen nails. A square yard contains nine square feet, and a cubic yard twenty-seven cubic feet. A yard equals 91'4392 square centimetres, a square yard 8361'13 square centimetres, and a cubic yard 764,535 centimetres. *Yard*, the A.S. *gyrd*, *gierd*, meant originally a stick or rod of any length, being a variant of *gād* = a goad or sting.

Yardland, or VIRGATE, an old English measure of land, varying from 10 to 30 or 40 acres. It was the normal holding of a tenant of arable land, and the variation probably arises from the fact that in early times land was measured more by quality than by extent. See BOVATE.

Yare, or YAR, riv., Norfolk, England, rises near Shipdham,

and flows for 50 m. E. to the sea at Yarmouth. Its principal tributaries are the Wensum, Waveney, and Bure.

Yaritagua, tn., Venezuela, in state of Lara, 20 m. E. by N. of Barquisimeto, in the centre of a coffee, sugar, and tobacco region. Pop. 12,000.

Yarkand, tn., cap. of E. Turkestan, Asia, on the Yarkand Daria, 106 m. S.E. of Kashgar; is surrounded by walls. It is the chief trading centre with N. India across the Karakoram Pass. The 'new town' and fort of Yanghi-shahr is in the N.W. of the town. Saddlery, leather-ware, carpets, and cotton, woollen, and silk goods are manufactured. Pop. (Sven Hedin's estimate in 1900) 100,000 (mainly Mohammedans). The rich oasis in which it is situated has a pop. of 200,000. Gold and precious stones occur in the vicinity.

Yarkand Daria, riv. of Eastern or Chinese Turkestan, forming the chief head-water of the Tarim. Its ultimate sources rise on the N. side of the Karakoram range; its course is first N.W., then N. and N.E. until it enters the plains of Kashgaria, after a 200 miles' struggle through the western Kuenlun Mts. In the lowlands it flows N.E. by Yarkand to its junction with the Kashgar Daria, Khotan Daria, and Ak-su, after which the united river must be considered as the Tarim. Its length is fully 600 m.

Yarmouth, or GREAT YARMOUTH. (1.) Municipal, parl., and co. bor., seapt. and wat.-pl., Norfolk, England, on the Denes, a narrow peninsula at the mouth of the Yare. It extends for about 3½ m. along the shore. There are two piers, marine parade, ornamental and winter gardens, and recreation grounds. The church of St. Nicholas is ancient, and one of the largest parish churches in Eng-

land. The 13th-century refectory of St. Nicholas Priory is now a school. Yarmouth is a centre of the herring and other fisheries, and has a large fish-curing industry. Ship and boat building, and the manufacture of ropes, nets, and silk crape, are carried on. On N. Denes are excellent golf links, and on S. Denes a monument to Lord Nelson and a racecourse. Gorleston, a southern suburb, is now part of the co. bor. of Great Yarmouth. Pop. (1911) 55,808. (2.) Town, seapt., and yachting station, Isle of Wight, 10 m. w. of Newport. Pop. 950. (3.) Seaport tn., Nova Scotia, Canada, on Atlantic coast, 135 m. s.w. of Halifax, at the extreme w. end of the province, on a beautiful narrow harbour, 3 m. from the Atlantic. It is the chief shipbuilding centre in Nova Scotia, and manufactures boots and shoes, boilers, stoves, patent medicines, and machinery. Pop. 8,500.

Yarmouth Roads, off the coast of Norfolk, England, afford safe anchorage in from 15 to 18 fathoms, except in E. or N.E. winds.

Yarns, COUNTING OR GRISTING OF, the method of determining the dimensions, diameter, or weight of a thread. The following systems are those most generally in use.

Cotton.—Single yarns are based upon the number of hanks of 840 yds. each contained in 1 lb. (avoir.) or 7,000 grs. (troy). The hank of 840 yds. is reeled from the cop or ring bobbin after spinning. Thus, if in the gray state 30 hanks weighed 1 lb., it would be called 30 counts ($30 \times 840 = 25,200$ yds. in 1 lb.). A small percentage of moisture in the yarn over the natural moisture is allowed. When two or more threads are doubled or twisted together, the yarn is spoken of as twofold or threefold, and the

hanks per lb. are reduced in proportion to the folding or number of threads twisted. The method of denoting folded yarns is as follows:—Two threads of 60's folded would be written thus, 2/60; three threads of 60's folded, 3/60; and so on, equalling 30 and 20 hanks to the lb. respectively. Bump yarn or coarse counts below 2's are based upon the yards in one ounce—90 yds. bump means 90 yds. to 1 oz. A bundle of gray cotton yarn weighs 10 lbs.

Linen counts are based upon the number of leas of 300 yds. contained in 1 lb. A bundle of linen contains 200 leas.

Woolens.—The following are some of the principal systems:—Leeds and Huddersfield, by the number of yds. in 1 dram—for example, 20's skein wool, meaning 20 yds. of 1 thread, weighs 1 dram. Dewsbury is by the number of yards in 1 oz.; west of England by the number of times 20 yds. is contained in 1 oz.; Galashiels by the number of cuts of 300 yds. each in 24 oz. or 384 drams; Hawick by the cuts of 300 yds. each in 26 oz. In America the run and cut system is adopted mostly. The run is based upon 100 yds. per oz., or 1,600 yds. to 1 lb.: thus, 200 yds. weighing 1 oz. would be called two-run yarn. The cut is based upon 300 yds. to 1 lb.; two-cut yarn = 600 yds. to 1 lb.

Worsted counts are based upon number of hanks of 560 yds. to the lb. The system of counting doubled yarns is the same as with cotton, the difference being in the length of hank only.

Silk.—Spun silk, which is usually two or more fold, is also based upon the number of hanks of 840 yds. to the lb., like cotton. The only difference is in the doubled yarns. Whereas in cotton the hanks per lb. of cotton are reduced exactly in proportion to the threads folded, in silk the

hanks per lb. are exactly as stated: for example, 80's twofold, written 80/2, would mean 80 hanks per lb.; only in the doubling process two threads of 160 would be twisted together.

Raw silk systems of counting are various. One method is the number of drams a 1,000 yd. hank weighs—four-dram silk = weight of 1,000 yd. hank. Another is the denier system, by the number of deniers contained in 1 hank. The denier is a doubtful quantity, it being given as 20 = to 16½ grs., and sometimes 32 to a dram. See Brooks's *Weaving Calculations* (1889), and Ashenhurst's *Textile Calculations* (1893).

Yaroslav. (1.) Or YAROSLAVL, gov. of Central Russia, bounded by Tver and Novgorod on the w., Vologda on the N., Kostroma on the E., and Vladimir and Tver on the S. It occupies a broad depression, traversed by the Volga. The soil is only moderately fertile. Flax is produced, and there are cotton, linen, and flour mills, distilleries, tobacco factories, and chemical and machinery works. Area, 13,723 sq. m. Pop. 1,200,000. (2.) City and archiepiscopal see, cap. of above gov., on Volga, 155 m. N.N.E. of Moscow; has manufactures of cotton, tobacco, and flour. The cathedral dates from early in the 13th century. Yaroslav was the capital of an independent principality from 1026 to 1471. Pop. 72,000.

Yarrell, WILLIAM (1784-1856), English naturalist, carried on his father's business as a newsagent, but published *History of British Fishes* (2 vols. 1836) and *History of British Birds* (3 vols. 1843). These embodied accurate descriptions, with woodcuts, of every species of fish and bird native to Britain, and are standard works. The former was republished in 1859 (3rd ed.), the latter in 1881-

85 (4th ed.). See Memoir by Van Voorst, prefixed to *British Fishes* (1859).

Yarrow, classic Scottish stream, rises on the watershed between the counties of Peebles, Selkirk, and Dumfries, and flows to St. Mary's Loch. After issuing from this it flows mainly N.E. to join the Ettrick in a beautifully wooded valley two miles from Selkirk, after a course of twenty-five miles. The valley, especially in the upper reaches, is pastoral, and its fascination is strengthened by its ballad literature and the writings of Hamilton, Hogg, Scott, Wordsworth, Shairp, and others.

Yarrow. See ACHILLEA.

Yass, tn., New South Wales, on riv. Yass, 150 m. (direct) S.W. of Sydney. Copper, silver, lead, and gold occur in the vicinity. Pop. 2,500.

Yass-Canberra, the site of the federal capital of the Commonwealth of Australia, is situated in New South Wales, near the town of Yass. In January 1911 the Commonwealth acquired for the purpose 800 sq. m. of territory in this district, the control of the water supply over 510 sq. m. additional, and 2 sq. m. at Jervis Bay, with the right to construct a railway thereto.

Yassy. See JASSY.

Yate, ARTHUR CAMPBELL (1853). He served through the Afghan war (1879-80), on the Afghan Boundary Commission (1884-5), in Burma (1886-8), and has travelled extensively in Persia and Russian Central Asia. Among his books are *England and Russia Face to Face in Asia* (1886), *John Houghton* (1900), and *The Army and the Press* (1901).

Yates, EDMUND HODGSON (1831-94), English journalist and novelist, was born at Edinburgh; entered the General Post Office in 1847, and from 1862-72 was head of the missing-letter depart-

ment. He edited successively *Town Talk* (1858), *Temple Bar* (1860-7), *Tinsley's Magazine* (1867-74), and *Time* (1879-83). In 1874 he founded a weekly periodical, the *World*, which met with marked success as a society paper. Yates wrote some novels—*Broken to Harness* (1864), *Kissing the Rod* (1866), and *Black Sheep* (1867). In 1885 he was imprisoned for a libel on Lord Lonsdale. See his *Recollections and Experiences* (1884-5).

Yatsauk, or LAWKSAWK, cap. of Yatsauk state, Burma, 71 m. s.e. of Mandalay. The state is one of the Shan states. Area, 2,200 sq. m. Pop. 25,000.

Yauco, tn., Porto Rico, on the American railway, about 40 m. s.e. of Mayaguez. Pop. 27,000.

Yautepec, vil., Mexico, in state of Morelos, 40 m. s. by E. of Mexico city. Pop. 6,200.

Yawl. See SAILS AND RIGGING.

Yawning, a prolonged deep inspiration following successive attempts at numerous inspirations, the mouth, fauces, and glottis being widely open and the lower jaw depressed. The succeeding expiration is shorter, and both acts are usually accompanied by prolonged characteristic sounds. Yawning is involuntary, and is generally caused by drowsiness, ennui, or fatigue; but it may be induced by the sight of another person yawning.

Yaws, or FRAMBESIA, a disease peculiar to the negro. It is epidemic, and is communicable by actual contact and by inoculation. It is characterized by the development of yellowish or reddish-yellow tubercles, which gradually form a moist exuding fungus over the skin, without constitutional symptoms except the debility which follows ulceration and continued discharge. The disease usually continues from two to four months, but may extend over several years. Ab-

solute cleanliness is essential for a cure, and the patient should have generous diet. Locally, carbolic lotions and mercurial ointments should be applied.

Yazoo City, city, Mississippi, co. seat of Yazoo co., 45 m. N.E. by E. of Vicksburg; there are cotton-seed oil mills, cotton factories, and lumber mills. Pop. (1910) 6,796.

Yeadon, urban dist., W. Riding, Yorkshire, England, 4 m. s. of Otley; has extensive woollen manufactures. Pop. (1911) 7,442.

Year, the period of the earth's revolution round the sun. Three kinds are distinguished—the sidereal, the anomalistic, and the tropical. The sidereal year consists of 365 dys. 6 hrs. 9 min. 9 sec. It strictly measures the time of one terrestrial circuit in space. The anomalistic year, or the interval between two successive passages of perihelion by the earth, is, by the progressive movement of the terrestrial line of apsides, rendered $4\frac{1}{2}$ min. longer than the sidereal year, and comprises 365 dys. 6 hrs. 13 min. 48 sec. It is used only in calculations of perturbative effects. The length of the tropical year, 365 dys. 5 hrs. 48 min. $45\frac{1}{2}$ sec., is the lapse of time from one vernal equinox to the next. Its comparative shortness is caused by the precessional westward shift of the equinoctial point. It is the year of civil life and of chronological reckoning. Tropical years are divided into 12 calendar months, as follows: January, 31 days; February, 28 or 29 days; March, 31 days; April, 30 days; May, 31 days; June, 30 days; July, 31 days; August, 31 days; September, 30 days; October, 31 days; November, 30 days; December, 31 days. These designations are of Latin origin. January, established as the first month in 46 B.C., was sacred to the god Janus. February was

called from Februa, a festival of purification celebrated on the 15th of that month. March, from the god Mars; April, from *aperire*, 'to open,' the earth then 'opening' to produce fruit. May was dedicated to the goddess Maia. June took its name from the Junian gens or family. July and August were appropriated respectively by Julius and Augustus Caesar. They had previously been entitled Quintilis and Sextilis, as being the fifth and sixth from March, the primitive first month. September, October, November, and December indicate the ancient order of succession (seven, eight, nine, and ten). The days of the months sum up normally to 365, while the year is about 365½ days. The introduction of quadrennial 'leap years,' in which February has 29 days, somewhat overcorrects the inequality; hence the Gregorian calendar added a counter-rectification by dropping from the series of leap years such century years as are not divisible by 400. Thus, 1700, 1800, and 1900 were years of 365 days; but 2000 and 2400 will each contain 366 days. (See further under CALENDAR.) Down to 1752 the legal New Year's Day in England was on March 25. In most civilized countries the year now begins at midnight on December 31. The Chinese year probably opened originally at the winter solstice, while in Babylonia the first day coincided with the spring equinox. Both cycles were 'luni-solar'—that is, the sun and moon concurred to regulate them. They had a normal complement of twelve lunations, extended to thirteen about once in three years, so as to fill the due measure of 365 days. The Jews still employ such a system. Their years are arranged in cycles of 19—the 3rd, 6th, 8th, 11th, 14th, 17th, and 19th years in which, termed 'embolismic,'

include 13, the intermediate 'ordinary' years 12 months each. Until the middle of the 18th century, indeed, a simple lunar year of 354 days was in use, modified only so far as to secure its beginning at new moon. The Mohammedan year is similarly independent of the sun. It comprises 12 months alternately of 29 days and of 30 days, supplemented by the addition of a day each to 11 years out of 30. The beginning of these years evidently retrogrades rapidly through the seasons. This was also, though in a less degree, the case with the Egyptian 'vague year' of 365 days. It made a complete circuit in the 'Sothic period' of 1,461 solar years. A fixed year, beginning August 29, and corrected by the quadrennial intercalation of a day, was substituted for it about 238 B.C. The Vedic year was luni-solar; it was counted from the first new moon following the approximate entry of the sun into Aries (E. Plunket, *Ancient Calendars*, p. 142). The modern Hindus reckon from the new moon preceding the arrival of the sun at the initial point of the lunar zodiac, near the two chief stars of Aries (*ibid.* p. 136). Greek and Latin time reckonings were finally regularized by the Julian reform. The ecclesiastical calendar adopted in all Roman Catholic and in most Protestant countries is partly regulated by the solar and partly by the lunar year, thus giving rise to the distinction between movable and immovable feasts. See CALENDAR.

Yeast, the name given to a family of micro-organisms, the Saccharomyces, that are instrumental in bringing about the alcoholic fermentation of sugar. The most useful variety of the family is *S. cerevisia*, which occurs in two forms that produce what is known as 'top' and

'bottom' fermentation, utilized in the manufacture of English and German beer respectively. *S. pastorianus* and *S. ellipsoideus* are the main cause of the fermentation of grape and fruit juice to form wine. In general the yeast plant consists of a number of microscopic round or oval cells, which often form branching chains. Yeast only grows satisfactorily when (1) in a watery medium containing a fermentable sugar; (2) in the presence of a suitable proportion of nitrogenous and mineral matter—such as phosphates, potash, lime, etc.—that is required in the building up of their structure; (3) at a suitable temperature, best at about blood heat; and (4) as long as the alcohol produced by their action does not exceed about 15 per cent. Fermentation only takes place with growing cells. Yeast is also unable to ferment cane sugar or malt sugar directly, though it contains an enzyme which is capable of inverting these sugars, or converting them into levulose and dextrose, which are fermentable. The latter sugars decompose into alcohol and carbon dioxide. Although alcohol is the chief product sought in fermentation by yeast, it is the carbon dioxide that is utilized when yeast (barm) is employed in bread-making, the gas blowing out the dough into a light and spongy form. Yeast can be separated from the liquor, pressed, and even dried, without destroying its vitality.

Yeats, WILLIAM BUTLER (1865), Irish poet, born in Dublin, is the most distinguished representative of the contemporary Irish literary revival. He is superintendent of the Irish Literary Theatre, and writes and lectures. In 1904 he paid a visit to the United States. His *Wanderings of Oisín, and Other Poems* (1889) gave him a place as a poet of individual vision

and individual music. Every volume of verse since, including the poetic dramas *The Countess Cathleen*, *The Land of Heart's Desire*, and *Cathleen ni Hoolihan*, has added to Mr. Yeats's reputation as a master of subtle verbal music, and as a poet of an intense and vivid imagination. On the other hand, it cannot be said that anything in the beautiful dramatic poem *The Shadowy Waters*, in *The Wind among the Reeds*, or *In the Seven Woods*, has fulfilled the promise of his first book. More marked has been Mr. Yeats's development as a prose writer since his *Celtic Twilight* of 1893. The short romances of *The Secret Rose*, the essays of *Ideas of Good and Evil*, reveal prose as delicate and as subtle as any written at the present time. The play, *Where there is Nothing* was published in 1903, and several others have followed (*Plays for an Irish Theatre*, 1904, etc.). Mr. Yeats has also edited several reprints and anthologies—e.g. the 3 vol. ed. (in collaboration with Mr. Ellis) of the works of William Blake (1904), and published *Representative Irish Tales* (1904). A collected edition of his works appeared in 1908.

Yecla, city, prov. Murcia, Spain, 42 m. N. of Murcia, an old Roman and Arabic city, with many ancient ruins. The district produces wine, fruit, and esparto grass. Pop. 19,000.

Yedo, the name applied until 1868 to Tokyo, Japan.

Yefremov, tn., Russia, in gov. of and 80 m. S.E. of Tula. Pop. 9,000.

Yegorievsk, tn., Ryazan gov., Middle Russia, 60 m. N.W. of Ryazan; has manufactures of cotton. Pop. 24,000.

Yeisk, port in Kuban gov., Caucasia, Russia, on bay of same name, on E. coast of Sea of Azov; has oil works and tanneries, and exports grain. Pop. 42,000.

Yekaterina, or CATHERINE HARBOUR, a harbour, Russia, in the gov. of Archangel, on the Arctic Ocean, 5 m. from the mouth of Kola Bay, in lat. 69° N. and long. 33° E. It is ice-free all the year round. Here was opened in 1899 the naval station of Alexandrovsk.

Yekaterinburg. See EKATERINBURG.

Yekaterinodar, tn., cap. of Kuban prov., Caucasus, Russia, on r. bk. of Kuban, 155 m. s.s.w. of Rostov-on-Don; has fruit gardens, and a large trade in corn and flour, and is the residence of the hetman of the Kuban Cossacks. Pop. 70,000.

Yekaterino-Nibolsk, a settlement of the Amur Cossacks, Amur prov., Siberia, on l. bk. of Amur, 100 m. w. of the mouth of the Sungari.

Yekaterinoslav. See EKATERINOSLAV.

Yelabuga. See ELABUGA.

Yelatma, tn., gov. Tambov, Central Russia, on l. bk. of Oka, 83 m. n.e. of Ryazan; has manufactures of agricultural implements. Pop. 9,000.

Yelets. See ELETS.

Yelisavetgrad. See ELIZAVETGRAD.

Yelisavetpol, or ELIZABETPOL. (1.) Government, Russia, in Transcaucasia, extends from the main range of the Caucasus across the Kura steppe to the river Aras. The southern part is chiefly occupied by mountain ranges and tablelands, and agriculture is confined to the valleys, where mulberry trees are grown to feed silkworms, and wine is produced. Liquorice root is also cultivated. The rearing of livestock and carpet-weaving are largely carried on. Copper, magnetic iron, and cobalt are obtained. Armenians and Tartars are the predominating elements of the population. There are also Dukhobors and Molokani

(Russian dissenting sects), and German colonies. Area, 16,721 sq. m. Pop. 1,100,000. (2.) Town, cap. of above gov., 106 m. s.e. of Tiflis; was known as Ganzha until 1804. It has a citadel and a mosque, built about 1620 by Shah Abbas of Persia, and was the birthplace of the 12th-century Persian poet Nizamed-Din. Yelisavetpol is noted for its grapes, and other fruits are grown. Pop. 38,000.

Yell, second largest isl. of the Shetland group, Scotland, lying N. of Mainland, and separated from it by Yell Sound. It is 17 m. from N. to s., and covers an area of 81 sq. m. Fishing is the chief industry. Pop. (1911) 2,348.

Yellow Bird, a name given in America to the goldfinch and to the warbler.

Yellow Chill. See BLACK-WATER FEVER.

Yellow Fever, a febrile disease endemic in the tropical and subtropical regions of Central and S. America, in the W. Indies, and in tropical W. Africa. It has also appeared in epidemic form in the southern parts of the United States. Negroes are much less susceptible to infection than are whites, and temporary visitors are more liable to the disease than are residents. Yellow fever is characterized by jaundice and by hemorrhages, and is due to the action of a specific virus in the blood. The germ has not yet been identified, but a mosquito, the *Stegomyia fasciata*, is responsible for its conveyance from one victim to another. The incubation period is usually three or four days, but it may be only twenty-four hours. The onset is associated with headache, rigor, vomiting, and rapid rise of temperature. The initial fever is followed by a remission marked by fall of temperature and abatement of the symptoms. Convalescence may then follow; but

in the majority of cases a third stage or febrile reaction ensues, in which the temperature again rises, with great aggravation of the symptoms, rapid development of jaundice, and increase of the vomiting. In a considerable number of cases black vomit points to gastric hæmorrhage, and frequently the stools also are hæmorrhagic. Bleeding may likewise occur from the kidneys, the gums, and the skin, and albuminuria is common. In its graver forms yellow fever is one of the most fatal of epidemic diseases, and even in its milder forms relapses are common; but one attack usually confers immunity for the rest of the patient's life. In the treatment of yellow fever the patient's strength should be maintained at the highest possible level, and heart tonics and stimulants are often of service. Drugs given by the mouth are seldom efficacious, but the sickness may be checked by sucking small quantities of ice, and by hypodermic injections of morphine. Nutritive enemata are valuable while the vomiting continues. An energetic campaign against mosquitoes has resulted in the suppression of the disease wherever the campaign has been carried out efficiently. See **MALARIA**.

Yellow-hammer, or **YELLOW-BUNTING** (*Emberiza citrinella*), a species of bunting, common throughout Britain and northern Europe generally, and extending into Siberia. It is resident throughout the year in the British area, and is very abundant in many localities. The length is about six and a half inches, and the general colouring mottled brown above and yellow below, the head being yellow, streaked with brown, and the rump and tail coverts chestnut. The male is more brightly coloured than his mate. The food is chiefly insects

in spring and summer; fruit in autumn; and grain and seeds in winter. The nest is placed usually upon the ground, and contains from four to five eggs.

Yellow Jack, another name for **YELLOW FEVER**.

Yellow Pigments. See **PIGMENTS**.

Yellow Remittent Fever. See **BLACKWATER FEVER**.

Yellow River, **HWANG-HO**, or **HOANG-HO**, riv. of China, drains a basin of over 600,000 sq. m., and is estimated at nearly 2,500 m. long. It rises to the s. of the Shuga range, between Tsaidam and the Tang-la range in Tibet, near the sources of the Yang-tse-kiang, and soon after passes through Jaring-nor and Öring-nor. In deep ravines, it sweeps round the s.e. end of the Amnemachin Mts., cuts through the Burkhan-Buddha range, and striking e. enters the province of Kan-su. From Lan-chou in that province it turns sharply N.N.E. to lat. 41°, rounds the Ordos desert, where its course has varied considerably at different times, and on passing long. 111° plunges s. through a gorge which separates the province of Shen-si from the province of Shan-si, until in about lat. 34° it meets the Wei and turns at right angles (e.). For 120 m. farther high banks confine its course, but below Meng-chin it expands and shallows, and from Su-shui onwards embankments impose but a temporary check on its ravages. At Lung-mên-kou, e. of Kai-feng, the river turns N.E. in a bed adopted in 1852, and continues its course through low-lying land to the sea—i.e. the Gulf of Pechili. The Tao-ho (r. bk.) and Ta-tung (l. bk.) in Kan-su, the Fên (l. bk.) in Shan-si, the Lo (r. bk.) and Chin-shin (l. bk.) in Ho-nan, are its only large tributaries. From Lan-chou rafts descend to Pao-tou

and Ho-kou, and occasionally even to Tung-kuan. East of that place boats venture on the river, and near Kai-feng there is some boat traffic; but large boats only come as far up the river as Tsi-ho (port of Tsi-nan-fu), and sea-going junks to Tieh-mén-kuan. Since 602 A.D. the river has shifted its mouth ten times between lat. 34° and 39° N., the last change occurring in 1889. It is estimated that the river carries about 800 million tons of sediment to the sea every year, and its periodical disastrous floods are largely due to the amount of detritus it brings down.

Yellow Sea, or HWANG-HAI, division of the Pacific Ocean, between Korea and China, divides into the Gulf of Korea, the Gulf of Pechili, and its N. branch the Gulf of Liao-tung. It is shallow, and nowhere more than 300 ft. deep. It is generally supposed to receive its name from the Hwang-ho or Yellow R., which carries down much yellow mud from the interior.

Yellowstone, riv. of the western United States, a right-hand branch of the Missouri, rises in the Shoshone Mts. of N.W. Wyoming, flows N. across Yellowstone National Park into Montana, where it turns to the E. and then to the N.E., joining the Missouri on the w. boundary of N. Dakota. In the Yellowstone Park it flows through Yellowstone Lake and over the upper and lower falls (112 and 310 ft. in height respectively), and through the Yellowstone Grand Cañon. For a distance of 10 to 12 m. the cañon is cut about 2,000 ft. below the adjacent margins of the plateau, the river here being only 160 to 200 ft. wide. It is navigable for small steamers from the mouth to Livingston in Montana. Its length from its mouth to Yellowstone Lake is 569 m. Its total length is

1,000 m., and its drainage area is 69,683 sq. m. The mean discharge at Livingston is 4,400 cub. ft. per second.

Yellowstone National Park, a tract of land comprising 3,575 sq. m., lying mainly in N.W. Wyoming, and extending slightly over into Idaho and Montana. It has been reserved from settlement by the United States government since 1872. The park is nearly rectangular in form, being 54 m. E. and W. by 62 m. N. and S. Its surface consists largely of a rolling plateau of nearly 8,000 ft. elevation, from which arise several groups and short ranges of mountains (10,000 to 12,000 ft.), while along the E. border lies the rugged Absaroka range. Nine-tenths of the whole area is forest. It is drained N. by the Yellowstone and Madison Rs., and S. by the Snake. Its surface is dotted with lakes, the largest being Yellowstone Lake. Its streams contain numerous falls and rapids, the most notable of which is the Lower Yellowstone, 310 ft. in height. Its streams, particularly the Yellowstone, flow in deep cañons. The Grand Cañon of the Yellowstone is celebrated not so much for its depth and magnitude as for the bright colouring of the rocks in which it is cut. Hot springs are found in almost all parts of the region, while the geysers are confined to a few localities. Near the N. boundary are the Mammoth Hot Springs. Upon Madison R. in the W. part of the park are several groups of geysers—the Norris Geyser basin, and the Upper and Lower Geyser basins. Of these, the most notable is the last, which contains many geysers throwing water to heights of from 100 to 200 ft., and in such volume that the waters of the Madison R., here called the 'Fire Hole,' are warm even in winter. A group of geysers and hot

springs is found on the shore of Shoshone Lake, at the head of Snake R., and upon the shores of Heart Lake. On the Yellowstone R., a short distance below Yellowstone Lake, is a geyser throwing thick mud instead of water. Excelsior geyser is the largest of all. Old Faithful, so named because of its exceptional regularity, every 64 or 65 minutes discharges a column 150 ft. high, amounting to $1\frac{1}{2}$ million gallons of water at each eruption. The park is traversed by coaches, running along excellent wagon roads, with hotels at several points. See Raftery's *Historical and Descriptive Sketch of the Yellowstone National Park* (1909) and Chittenden's *Yellowstone National Park* (1895).

Yellow Wood (*Cladrastis tinctoria*), an American tree belonging to the order Leguminosæ. It is a tall-growing tree, with a smooth bark and yellow wood. In summer it bears loose, drooping panicles of long, fragrant, white flowers. The whole tree is of a graceful habit. From its wood a dye is prepared.

Yembo. See YANBU.

Yemen. See ARABIA.

Yen-bal, tn., cap. of a circle in Tong-king, French Indo-China, 78 m. N.W. of Hanoi, the head of navigation on the Red R.

Yendi, tn., Togoland, German West Africa, 240 m. N.N.W. of Lome, the chief port and capital. Pop. 12,000.

Yenikale. See KERCH.

Yenisei, riv. of Siberia, flowing into the Arctic Ocean. Its sources lie S. of the Sayanski Mts., and after breaking through these it flows generally N., picks up from the right the Upper Tunguska or Angara, and after receiving, also on its right bank, the Stony Tunguska and the Lower Tunguska, and spreading out to a great width, enters the Yenisei Gulf by a large

delta. The drainage area is 980,000 sq. m., and the length of the river 3,000 m. But if the Selenga be taken as its upper course, its length is fully 500 m. greater. The Selenga, formed by streams flowing from the Kosso-gol and the Khangai Mts., and joined by the Orkhon from the edge of the Gobi, enters Lake Baikal. Steamers ply about 170 m. up. Along the Angara steamers ply regularly between Listvenichnoye, on Lake Baikal, and Konovalovo, below Balagansk. Below Bratski Ostrog a series of rapids blocks this river, but the bed is being cleared. On the main Yenisei steamers ply from Yeniseisk to Minusinsk, about 450 m. Boats only are used below Yeniseisk. Like the Obi, the Yenisei has been several times reached by sea, Captain Wiggins having first entered the mouth in 1874. Its tributary, the Great Kaz, is connected by canal with the Ket, a tributary of the Ob. There are altogether 12,240 m. of navigable waterways in Lake Baikal and the Yenisei basin, of which 3,710 are utilized by steamers.

Yeniseisk. (1.) Government of E. Siberia, extending from the Sayan Mts. on the Chinese frontier N. to the Arctic Ocean, and from the Anabara R. on the E. to the watershed between the Yenisei and Ob Rs. on the W. In the S. are the wooded slopes of the Sayan Mts. and of the Kuznetski Ala-tau, with their mines; N. of these the agricultural regions of Minusinsk, Achinsk, and Kansk; then a broad belt of forest reaches up into the Arctic circle and along the rivers up to 70°. Beyond the mouth of the Podkamennaya (Stony) Tunguska the country to the E. of the Yenisei contains numerous ranges, the chief of which is the Siverma. There are mines on the Pit, Lower Tunguska, and other

right-hand affluents of the Yenisei. Coal and iron are mined on the Abakan R. Rich deposits of graphite, in the valleys of the Lower Tunguska and Bakhta, have been worked since 1891. Gold and silver also occur. The native inhabitants live by grazing, reindeer-hunting, and fishing. They belong to the Samoyede, Yakut, Ostiak, and Tungus families. In the s. are the Buriat Mongols. Area, 981,607 sq. m. Pop. 700,000. (2.) Chief tn. of above gov., Siberia, on l. bk. of Yenisei, 170 m. N.N.W. of Krasnoyarsk. Gold is mined in the vicinity. It was founded in 1618. Pop. 12,000.

Yeola, tn., Nasik dist., Bombay Presidency, India, 58 m. N.W. of Aurungabad. It is noted for its gold-twist and cotton and silk goods. The silk trade employs about 7,000 persons. Pop. 17,000.

Yeoman, a term used in the 15th and 16th centuries to describe a small freeholder. It was also given later to the 'forty shillings freeholder' by Parliament, and has been understood to signify the class which lies between the substantial farmer and the labourer.

Yeomanry is now included in the Territorial Force, except that the two Irish regiments belong to the Special Reserve. The distribution of the remaining 54 regiments was left unaltered by the Territorial and Reserve Forces Act. A regiment now consists of headquarters, a machine gun section, and 4 squadrons—or a total of 25 officers and 449 men, including the regular staff. For training, etc., see TERRITORIAL FORCE.

Yeomen of the Guard, an ancient bodyguard of the sovereign, first organized in 1485 by Henry VII. It is recruited from deserving old soldiers of dis-

tinguished service. Exclusive of officers, the corps numbers 100. The officers are chosen from among retired officers of the army of distinguished service and good family. They consist of a captain, usually a peer, a lieutenant, an ensign, a clerk of the cheque (who keeps and calls the cheque or roll), and four exons (a term formerly equivalent to corporal). The yeomen of the guard wear a scarlet uniform of quaint Tudor pattern, highly decorated with royal emblems; that of the officers is of a more modern type. The men are armed with partisans and short swords. The bodyguard is on duty at the King's levees and drawing-rooms, and at almost all court ceremonies. The warders of the Tower wear the same uniform, and are honorary members of the corps; but they have distinct duties connected with the Tower of London, and are not part of the bodyguard, nor under its officers. The term 'beefeater' (*buffetier*, or 'sideboard man') is commonly applied to both yeomen and warders. See Sir R. Hennell's *History of the Yeomen of the Guard* (1904).

Yeotmal, chief tn. of Yeotmal, dist. Berar, India, 80 m. s.w. of Nagpur. Pop. 11,000. The district formed in 1905 includes the former Wun district, and is rich in iron ore. Area, 5,180 sq. m. Pop. 580,000.

Yeovil, munic. bor., Somersetshire, England, on the Yeo, 22 m. s. of Wells. St. John's, a handsome 14th-century church, is called 'the Lantern of the West'—crypt 13th century. The town is noted for the manufacture of gloves. Pop. (1911) 13,760.

Yerkes, CHARLES TYSON (1837-1905), American financier, was born at Philadelphia. In 1860 he secured a controlling interest in a Philadelphia street railway. He thereafter acquired large in-

terests in continental, New York, and Chicago lines. The problem of London traffic and the projected Central London Railway attracted him, and he became a large shareholder in the London underground lines, and a strong advocate for their electrification. The Underground Electric Railway Company, Limited, with a capital of £5,000,000, and Mr. Yerkes as chairman, was founded with the object of converting the Metropolitan District line from steam to electric traction. He founded the Yerkes Observatory at Lake Geneva, Wisconsin.

Yermak, TIMOFEEV (d. c. 1584), a Cossack who subdued a large part of Siberia in 1580. He was drowned whilst attempting to cross the Irtysh.

Yessentuki, health resort in Northern Caucasus, Russia, with alkaline springs, between Pyatigorsk and Kislovodsk, 10 m. from the former.

Yesso, YEZO, or EZO, the most northerly of the main islands of Japan, and officially known as Hokkaido, is separated from Honshu by Tsugaru Strait, and from Sakhalin by La Pérouse Strait. It covers an area of 36,289 sq. m., and is traversed from N. to S. by a central mountain chain, with volcanic peaks approaching 7,000 ft. The Ishikari-gawa (270 m.) is the longest river in Japan. Fishing is the chief industry. Coal and sulphur are exported from Kushiro. Other places of importance are Hakodate (the cap.), Sapporo, and Otaru. Pop. (1908) 1,132,095.

Yetholm, par., Roxburghshire, Scotland, and double village—Kirk-Yetholm and Town-Yetholm— $\frac{1}{2}$ m. apart, on the Bowmont, 7 m. S.E. of Kelso and 1 m. from the English border. It is the headquarters of the Scottish gypsies. Pop. (1911) 755. See Broekie's *Yetholm Gypsies*

(1884) and Lucas's *Yetholm History of the Gypsies* (1882).

Yew. The common yew (*Taxus baccata*) is a British evergreen tree of geological antiquity. It bears long, linear, coriaceous leaves, in colour dark above and pale beneath. Its fruit is borne with a red mucilaginous cup. The trunk has the curious appearance of being composed of a number of branches welded together. Usually at a few feet above the ground the trunk sends out leafy horizontal branches, which spread like great arms over a considerable area. Yew trees were very commonly planted in churchyards in Britain, probably for the reason alleged by Martyn—that it was an evergreen tree, and therefore a symbol of immortality. The ancient Britons, before the introduction of Christianity, planted yew trees near their temples.

Yezd, or YAZD, tn., Central Persia, 165 m. E.S.E. of Ispahan; has manufactures of silk, cotton, pottery, and felt. It is almost the only seat in Persia of the Gebrs, or Parsis, followers of Zoroaster. Antimony, nickel, and cobalt occur in the desert region near Yezd. Pop. 45,000.

Yezidis, or YEZDIS, a religious sect dispersed in small groups over Asia Minor, Armenia, Kurdistan, Mesopotamia, Persia, Arabia, and even as far east as China, numbering collectively about 50,000. They recognize as their supreme head the sheik-khán, resident at Baadli, 27 m. N.E. of Mosul. To their neighbours they are commonly known as Shaítáni ('devil-worshippers'), or Shem-sieh ('star-worshippers'); but they call themselves Davaem, a term, like Yezid, of unknown origin and meaning. Simbath, their reputed 'apostle,' is supposed to have been a Christian Nestorian (or perhaps Gnostic), who flourished in the 9th century in the

district of Van, Kurdistan; and Kurdish is still the current speech of most of their communities. But according to another theory their real founder was Sheikh Adi, who lived in the 14th century, and to whom is attributed the *Furkal*, or *Aswad*, a sacred book which contains their laws and liturgy, but has never been seen by any one. Their religious tenets betray Jewish, Moslem, Mazdean, and especially early Christian (Nestorian) influences. Although hated and slandered by all other sectaries, and often oppressed by the Turkish pashas, the Yezidis are a peaceful, industrious people, noted for their cleanly habits, and better conducted than most of their neighbours, but absolutely unlettered, so that all their laws, precepts, national legends, songs, and traditions have been handed on orally from the remote past. See W. G. Palgrave's *Official Report* (1868), and C. M. MacGregor's *Turkey in Asia* (1877).

Yezo, or **EZO**. See **YESSO**.

Yggdrasil, in Norse mythology, the mystical ash tree, which typifies existence. Its three roots stretch respectively into the realms of the gods, the giants, and of death; its stem supports the earth; its boughs overspread the whole world and reach beyond the heavens. Yggdrasil will survive the 'twilight of the gods' (Ragnarök).

Yiddish, a dialect spoken by the Jews of Central Europe, introduced by immigrants, and consisting of corrupted Hebrew, with a large admixture of German. In the east end of London, where Yiddish prevails, a Jew is called—in slang—a Yid, Yiddisher, Yeddan, or Jeddican. There is a considerable literature written in this jargon, mostly of a religious character, from the 16th to the 19th century, but since the beginning of the Zionist move-

ment and the persecutions in Russia (1880) it has taken a wider range. Yiddish boasts one poet of considerable power in Rosenfeld—e.g. his *Songs from the Ghetto* (1898). See Grünbaum's *Jüdisch-deutsche Chrestomathie* (1882), and Wiener's *The History of Yiddish Literature in the Nineteenth Century* (1899).

Yiewsley, urban dist., Middlesex, England, 2 m. s. of Uxbridge; has brick-making industry. Pop. (1911) 4,321.

Y.M.C.A., Young Men's Christian Association.

Ymir. See **MYTHOLOGY**, **NORTHERN**.

Ymuiden, tn., N. Holland prov., Netherlands, 15 m. w. by N. of Amsterdam, at the terminus of the North Sea canal. In 1910 the fish landed here realized £419,199. A new dry dock has been constructed, and in consequence of the development of the fishing industry the government has decided to enlarge the harbour and the fish market, and to build a large railway station close to these new works. Pop. 2,500.

Ynyscynhaiarn, urban dist., Wales, co. of and 15 m. s. by E. of Carnarvon. Pop. (1911) 4,447.

Yo-chou, walled city, prov. Hu-nan, China, at outlet of Tungting Lake into the Yang-tse-kiang, opened to foreign trade in 1900. As the gate to Hu-nan it is important, but foreign trade is only slowly developing. Pop. 20,000.

Yoga, in Hindu philosophy, one of the six Darsanas, or schools of Brahmanical philosophy, that of Patanjali, the essence of which is meditation on the Supreme Spirit and mortification of the body. Its disciples, Yogis, traverse India as fortune-tellers and conjurers.

Yokkaichi, open port, Hondo I., Japan, 70 m. E.N.E. of Osaka. During 1910 the imports were valued at £1,020,271, and the ex-

ports, chiefly shirtings, cotton yarns, tea, porcelain, and earthenware, at £379,657. Pop. 30,000.

Yokohama, chief seapt. of Japan, on E. coast of Hondo, and on Tokyo Bay, 16 m. S.S.W. of Tokyo and opposite Kanagawa, which it superseded as a treaty port in 1858. The railway connecting it with Tokyo was the first in Japan, being constructed in 1872. The harbour is protected by breakwaters, and there are four government dry docks. Silk, tea, cotton, flax, tobacco, copper, and coal are traded in. The well-to-do residents have their residences on 'The Bluff.' Imports (1910), £15,749,881; exports, £22,986,560—total, £38,736,441, or 41.1 per cent. of the total trade of Japan. Pop. 400,000.

Yokosuka, naval station, Japan, on Hondo, 14 m. S. by W. of Yokohama. Here are ship-building yards, dockyards, and arsenals. Pop. 25,000.

Yola, prov. in east of the British protectorate of Northern Nigeria. It is bounded on the E. by German Kamerun, and is watered by the Benue. Cotton, rice, and tobacco are cultivated. Area, 16,000 sq. m. Pop. about 300,000. The cap. is Yola, on the Benue, 390 m. N.E. of Calabar. Pop. 60,000.

Yonezawa, tn., Japan, in prefecture of and 25 m. S. by W. of Yamagata. Pop. 35,000.

Yöng-ampo, seapt., at the mouth of the Yalu, N.W. Korea. It has been an open port since 1908.

Yonge, CHARLES DUKE (1812-91), English historian, was born at Eton, and engaged in tutorial and literary work in London. In 1866 he was appointed regius professor of modern history and English literature at Queen's College, Belfast, an appointment which he held till his death. He was the author of

numerous text-books on Greek and Latin composition and grammar, compiled various classical and other dictionaries, and wrote *A History of the British Navy* (1863), *History of the English Revolution* (1874), and *Constitutional History of England* (1881).

Yonge, CHARLOTTE MARY (1823-1901), English novelist, spent her life chiefly at Otterbourne, Hampshire, her native place. Among her most popular novels are the *Heir of Redclyffe* (1853), *The Daisy Chain* (1883). *Modern Broods*, her last novel, appeared in 1900. Several books on historical subjects, on mission work, and on natural history testify to the versatility of her talent. See *Life and Letters* (ed. C. Coleridge, 1903).

Yonkers, city, Westchester co., New York, U.S.A., on the Hudson, 17 m. N. by E. of New York, of which it is a residential suburb. It manufactures carpets, rugs, elevators, sugar, photographic supplies, rubber goods, and hats. Pop. (1910) 79,803.

Yonne, dep. of N.E. France, traversed by the Yonne; covers an area of 2,892 sq. m. It is undulating. Agriculture, forestry, mining, quarrying of building-stone, vine-growing, sugar-refining, and glass-making are carried on. Pop. 315,000. Chief town, Auxerre.

York, co., munic., and parl. bor., city and head of the northern archbishopric, England, on the Ouse, 188 m. by rail N. by W. of London, and partly in each of the three Ridings of Yorkshire. The city was formerly surrounded by walls, the larger portion of which, with four ancient gateways or 'bars,' still remains. The cathedral church of St. Peter was founded in the 7th century. The present building, a magnificent cruciform structure, exhibits various styles of architecture, having been begun by Archbishop

Roger (1171), and continued by his successors till 1472. The external length is 524 ft., the breadth across the transepts is 250 ft., and the western towers are over 200 ft. high. It retains a Norman crypt, and possibly some fragments of Saxon work; and amongst several tombs of the archbishops is one of Walter de Grey (13th century). There are several other ancient churches. The archiepiscopal palace at Bishopthorpe, 3 m. s., is principally 17th and 18th century, with some vestiges of the earlier building. The castle at York was founded by William the Conqueror, but the present buildings are of various later dates. It is now used as a military prison and for the county assize court. The city is the headquarters of the N.E. military district, and there are large barracks near Fulford. Manufactures include glass, confectionery, leather, artificial manure, railway carriages, iron-founding, etc. *Caer Eborac* (as then named) was capital of the Brigantes. By the Romans it was called *Eboracum*, and became their military headquarters, and the usual residence of the emperors when they visited Britain. Septimius Severus and Constantius Chlorus died there. In early times it was a centre of Christianity. Saxon paganism subsequently obscured Christianity; but in 627 Edwin of Northumbria was baptized at York by Paulinus, who soon after became archbishop. In 1405 Archbishop Scrope, and in 1537 Aske, leader of the 'Pilgrimage of Grace,' were executed at York. In 1644 it was besieged and taken by the parliamentary forces. Pop. 82,297. See T. P. Cooper's *The History of the Castle of York* (1911), and *The Book of the York Pageant* (1909).

York. (1.) City, Nebraska, U.S.A., co. seat of York co., 50 m.

w. of Lincoln. Here is York College. Pop. (1910) 6,235. (2.) City, Pennsylvania, U.S.A., co. seat of York co., 85 m. w. of Philadelphia, with iron works, carriage, confectionery, and tobacco factories. Pop. (1910) 44,750. (3.) Town, Western Australia, in York co., 77 m. by rail E. of Perth, at the foot of Mount Bakewell, and on the Avon. Large quantities of sandalwood are exported from the district, which has a pop. of 3,000.

York, DUKES OF. See YORK, HOUSE OF; also STUART, HENRY.

York, HOUSE OF, played a prominent part in England in the 15th century. Edmund Langley (1341-1402), son of Edward III., was created Duke of York (1385). Of his two sons one was killed at Agincourt (1415), while the elder was beheaded in the same year. The latter's son was Richard, Duke of York, a statesman as well as a soldier, and the leader of the opposition to Queen Margaret, wife of Henry VI., until he fell at the battle of Wakefield (1460). His eldest son was Edward IV., and his second son, Richard III. By marrying Elizabeth, daughter of Edward IV., Henry VII. united the families of Lancaster and York, and strengthened his own position. For some years, however, the descendants of Elizabeth and George, Duke of Clarence, the younger children of Richard, Duke of York, continued to be a source of alarm to the Tudor sovereigns. The dukedom of York is generally conferred on his second son by the king of England. Among others who have borne the title are Henry VIII., Charles I., James II., Cardinal York (son of the Old Pretender), and the present King, who was created Duke of York in 1892. See Ramsay's *Lancaster and York* (1895), and *Political History of England*, vol. iv. (1906).

Yorke, PHILIP, EARL OF HARDWICKE. See **HARDWICKE.**

York Plays. See **MIRACLE PLAY.**

Yorkshire, north-east maritime co., the largest in England. The coasts are generally regular, bordered by cliffs of moderate height. Boulby Cliff (666 ft.), 10½ m. N.W. of Whitby, is the highest sea-cliff in England. The principal indentations are Bridlington, Filey, and Robin Hood Bays. The surface is varied, mountainous, and moorland in N.W. and N.E. On N.W. border is the Pennine Range (Wharfedale, 2,414 ft.; Ingleborough, 2,372 ft.), in N.E. are the Cleveland and Hambleton Hills, and in the E. the Wolds. The county is drained chiefly to the Humber by the Ouse and its tributaries Swale, Ure, Wharfe, and Don; on the N. border is the Tees; Esk, Derwent, and other streams flow direct to the North Sea, and the Hull enters the Humber. In the W. is the upper valley of the Ribbles. The scenery in several of the river dales is beautiful. Yorkshire is divided for administrative purposes into Ridings—North, East, and West—each constituting a separate administrative county. It is an agricultural and grazing county. Coal, especially in the W. Riding (in 1909, 36,000,000 tons were produced), iron ore (Cleveland district), clay, limestone, and sandstone are extensively worked. Chemicals are also manufactured on a large scale. There are mineral springs at Harrogate, Knaresborough, Croft, and Ilkley. The manufacturing centres are chiefly in connection with the coal-field of the W. Riding; woollens (Leeds, Bradford, Halifax, etc.); cotton and worsted goods, carpets, silk; cutlery, armour plate, and other heavy iron goods (Sheffield, etc.); leather (Leeds). The blast-furnaces number over 100,

and the total output of pig iron exceeds 2,500,000 tons per annum. There are also important fisheries and agricultural industries. The county returns twenty-six members to Parliament. Antiquities include ancient encampments, earthworks, monastic establishments (Rievaulx, Jervaulx, Whitby), and castles. In 1911 the area and population of the three Ridings were as follows:—

	Area in sq. m.	Popula- tion.
East Riding (with York).....	1,083	507,096
North Riding.....	1,995	417,075
West Riding.....	2,736	3,044,980
Total.....	5,814	3,969,151

See *Memorials of Old Yorkshire*, ed. by T. M. Fallow (1909); A. N. Cooper's *Across the Broad Acres* (1908); Gordon Home's *Yorkshire* (1908), and other works; J. S. Fletcher's *A Picturesque History of Yorkshire (1899-1900)* and *A Book about Yorkshire* (1908); and *Victoria County History—Yorkshire*.

Yorkshire College. See **LEEDS.**

Yorkshire Terrier, one of the most exquisite little dogs in existence; but its coat, trailing on the ground, silken and flossy, requires the utmost 'grooming' and attention. It was formerly known as the Scottish broken-haired terrier. It varies in weight from 3 to 13 lbs.; but there is very little chance for any animal scaling over 8 lbs. winning in the ring. Points:—Head moderately long and wedge-shaped; eyes of medium size, very keen and intelligent; ears (since cropping was abolished) carried semi-erect and V-shaped; body short and compact, covered with an abundance of long, straight hair, as fine and glossy as silk—that on body should be steel blue, free from black or tan hairs; the tail, which is usually docked, should be feathered with

dark-blue hair; face should have a long moustache of rich tan; the hair on the forehead should be of a light golden shade, while on the neck there should be a streak of rich, bright tan; legs straight, sound, and well tanned.

Yorkton, mrkt. tn., Saskatchewan, Canada, in the electoral district of Mackenzie, 109 m. N.E. of Regina. Pop. 3,000.

Yorktown, cap. of York co., Virginia, U.S.A., on York R., 35 m. E.S.E. of Richmond; was the scene of the surrender of Lord Cornwallis to Washington on Oct. 19, 1781. Pop. (1910) 136.

York von Wartenburg, HANS DAVID LUDWIG, COUNT (1759-1830), Prussian field-marshal, born at Potsdam. After service with the Dutch in the E. Indies, he entered, or rather re-entered (1787), the Prussian army. After a distinguished career in the Napoleonic wars (1794-1814), especially in the years 1813-14, he was created count (1814) and field-marshal (1821). See *Life*, in German, by Droysen (10th ed. 1889).

Yorubas, a people occupying the country between Dahomey and the Niger, and parts of the lower Niger and Niger delta. They are negroes, but do not exhibit the physical characteristics of the race to so marked a degree as their neighbours on the west, and are superior in culture. The old Yoruba kingdom was broken up in 1820 by an invasion of the Mohammedan Fulahs, who captured the city of Ilorin. Under the influence of Mohammedan institutions, and in the south of Christian missionaries, the Yorubas have made great progress in the arts of civilization. They are still divided into a number of tribes, each under its own chief, and are collected in populous cities, of which the most famous is Abeokuta, the capital of the Egbas. Yorubaland now forms

part of the western province of the British colony and protectorate of Southern Nigeria. See Dennett's *Nigerian Studies* (1910).

Yosemite Park, a tract of land in the Sierra Nevada of California, U.S.A., in Mariposa co., which has been reserved from settlement as a national park. There are, in fact, two parks. The Yosemite Valley State Park comprises 36,000 ac., which includes the Yosemite valley. This park belongs to the state of California, and is under its jurisdiction. Surrounding this is a much larger park, the Yosemite National Park, comprising 1,512 sq. m., which has been reserved by, and is under the control of, the United States government. The Yosemite valley is a gorge cut by glacial action. It is not more than seven miles in length, with an average breadth at bottom of half a mile, and from cliff to cliff of a mile and a half. Its depth ranges from 4,000 to 5,000 ft.; its walls are everywhere precipitous, and in many places vertical. The cliffs, domes, etc., along its walls form some of the finest scenery in the country. The valley is drained by the Merced, which with its affluents forms cascades of great height--e.g. Nevada Fall, 600 ft.; Vernal Fall, 400 ft.; Illilouette Fall, 600 ft.; Yosemite Falls (three in succession), 2,600 ft.; and Bridal Veil Fall, 900 ft. Well-known summits surrounding the valley are El Capitan, a sheer cliff rising from the valley to an elevation of 7,630 ft. above the sea; Sentinel Dome, 8,205 ft.; Glacier Point, 7,297 ft.; and Half Dome, 6,927 ft.; the elevation of the floor of the valley being about 4,000 ft. above sea-level. The country surrounding the valley and constituting the National Park forms a portion of the western slope of the Sierra Nevada. It presents in the main the

aspect of a rolling and hilly region, at an elevation of from 8,000 to 10,000 ft. above sea-level, with little soil or vegetation except a scattered forest growth. Fragments of glaciers still remain near the summits of the mountains. From this surface rise irregular domes and pinnacles of shattered granite, while the valleys in which soil has accumulated are well watered and covered with vegetation.

Youatt, WILLIAM (1776-1847), English veterinary surgeon, was born at Exeter. He began in 1828 a series of extra-mural lectures, which from 1830 to 1835 were delivered at London University—i.e. University College; and when the course was dropped he published them in the *Veterinarian*, a paper he had established. He wrote *Canine Madness* (1830); *The Horse* (1831); *Cattle—their Breeds and Diseases* (1834); *The Dog* (1845); *The Pig* (1847); and other works for the Library of Useful Knowledge.

Youghal, mkt. tn., seapt., and summer resort, co. Cork, Ireland, on Blackwater estuary. Portions of the old town walls and Sir Walter Raleigh's house still remain. Earthenware and bricks are manufactured. There is also an important salmon fishery. Pop. 5,300.

Youmans, EDWARD LIVINGSTONE (1821-87), American scientist, born at Colman, New York, was blind for several years as a boy. After taking his M.D. at Vermont, he became professor of chemistry at Antioch College (1866). Among his works are *Alcohol and the Constitution of Man* (1855); *Handbook of Household Science* (1857); *The Correlation and Conservation of Forces* (1864); and *The Culture demanded by Modern Life* (1867). Till his death he was editor of the *Popular Science Monthly*, founded in 1872; and in 1871 planned the

International Scientific Series. See *Life and Letters of Edward Livingstone Youmans*, by Fiske (1894).

Young, tnsnip., New South Wales, on N. side of Burrangong Creek, 70 m. W.N.W. of Goulburn; has gold mines. Pop. 3,000.

Young, SIR ALLEN WILLIAM (1830), English Arctic explorer, was born at Twickenham. As a naval officer he fought in the Crimea, was engaged in the search for Sir John Franklin, took an active part in the quelling of the Taeping rebellion in China under General Gordon, and was in command of the *Pandora* in the Arctic expedition of 1875-6. He was knighted in 1877. He published *Two Voyages of the Pandora in 1875 and 1876* (1879).

Young, ANDREW (1807-89), Scottish hymn-writer, was born in Edinburgh, and became a schoolmaster at Niddrie (1830) and then at St. Andrews (1840-53). He published *The Scottish Highlands, and other Poems* in 1876; but he is best known as the author of *There is a Happy Land*, which he wrote in 1838.

Young, ARTHUR (1741-1820), English agricultural author, lived chiefly at Bradfield Hall in Suffolk. The result of tours, undertaken with a view to studying agricultural methods, appeared in *A Six Weeks' Tour through the Southern Counties* (1768), *A Six Months' Tour through the North of England* (4 vols. 1771), and *A Tour in Ireland* (1780). In 1792-4 appeared *Young's Travels in France* (2 vols.), the record of journeys undertaken from 1787 to 1790, in which he added acute observation of political and social conditions to his investigation of the state of agriculture. Young was also editor of, and a frequent contributor to, a monthly periodical, *Annals of Agriculture*. His publications gave a decided impulse

to the scientific study of agriculture, previously almost unknown in England. See *Autobiography*, ed. by Miss Betham-Edwards (1898).

Young, BRIGHAM (1801-77), leader of the Mormons, born at Whitingham, Vermont; became a Mormon convert in 1832. In 1844 he was elected president of the Mormon Church. He founded (1848) Salt Lake City in Utah. He was appointed governor (1851), but had to resign much of his power when the States, in 1869, abolished polygamy. See **MORMONS** and **UTAH**.

Young, CHARLES MAYNE (1777-1856), English actor, was born in London. At Edinburgh, in 1802, he played Doricourt in the *Belle's Stratagem*, and won the friendship of Scott. In 1807 he made his first appearance in London as Hamlet. In the interregnum between Kemble and Kean and Macready, Young held the first place as a Shakespearean actor. His best parts are said to have been Hamlet, Octavian, Macbeth, Prospero, and Cassius, with Sir Pertinax Macsycophant and Megrim (in *Blue Devils*) as his comic characters.

Young, EDWARD (1683-1765), English poet, was born at Upham, near Winchester. In 1708 he was appointed to a law fellowship at All Souls, Oxford. He was befriended by the Duke of Wharton. In 1719 his tragedy *Busiris* was produced at Drury Lane; and in 1721 another tragedy, *The Revenge*. He published his satires, entitled *Love of Fame, the Universal Passion*, separately from 1725, and collectively in 1728. They anticipate Pope, but lack his fire and his asperity. On the accession of George II. he wrote *Ocean: An Ode*; but Young as a lyric poet is extraordinarily feeble. In 1728 he became a clergyman, and was appointed chaplain to George II.

He held the living of Welwyn (Herts) till his death. In 1730 he published his *Imperium Pelagi*, another lyric. *The Complaint, or Night Thoughts on Life, Death, and Immortality* (1742), Young's greatest poem, was begun in 1741 and completed in 1744. A certain 'staginess' blemishes this otherwise beautiful poem. The *Night Thoughts* have supplied us with many quotations; the diction is often fine, but sometimes exaggerated; often pointed, but sometimes marred by false antithesis. See Herbert Croft's account of him in Johnson's *Lives of the Poets*, and Boswell's *Life of Johnson*.

Young, SIR FREDERICK (1817), English traveller, born at Limehouse, London; became a merchant, and travelled in Greece, Turkey, and Canada. He was knighted in 1888. He has written *Long Ago and Now* (1863), *Imperial Federation* (1876), *A Winter Tour in South Africa* (1890), *Exit Party* (1900), and *A Pioneer of Imperial Federation in Canada* (1902).

Young, GEORGE YOUNG, LORD (1819-1907), Scottish judge, was born in Dumfries, and educated at the academy of his native town and at Edinburgh University. Admitted a member of the Scottish bar in 1840, and of the Middle Temple in 1869, he was one of the most brilliant advocates of his time. He took part in 1857 in the defence of Madeleine Smith, who was charged with the murder of her lover, L'Angelier; and in this, one of the most famous of Scottish criminal trials, he proved himself a brilliant pleader and an exceptionally skilful cross-examiner. Entering parliament as Liberal M.P. for Wigtown burghs, he was lord advocate 1869-74, signaling his tenure of office by helping to draft and to pilot through the House of Commons the Scottish

Education Act of 1872. He also succeeded in obtaining the Public Health Act for Scotland, and drafted a bill for the abolition of feudal tenure. In 1874 he was appointed to a judgeship in the Court of Session, which he held for upwards of thirty years.

Young, JAMES (1811-83), Scottish chemist, and inventor of a successful method of paraffin manufacture, was born in Glasgow, and became assistant to Professor Graham in that city (1831-2), and subsequently (1837) at University College, London. As manager of chemical works at Manchester (from 1844) he developed a new and cheaper method of making sodium stannate. Young's success was the foundation of a world-wide paraffin industry. He founded Young's chair of technical chemistry, Anderson's College (1870), Glasgow, and was a friend of Lord Playfair and of Dr. Livingstone, to defray the cost of whose explorations he contributed liberally. See Wemyss Reid's *Memorials of Lyon Playfair* (1883); also *Journal of the Chemical Society* (1884).

Young, ROBERT (1822-88), Scottish Oriental and Biblical scholar, worked as a printer in Edinburgh. During five years (1856-61) he superintended the mission press at Surat, India, and on his return devoted himself chiefly to the authorship and issue of works on Biblical criticism showing thorough scholarship. From 1864-74 he was head of the Missionary Institute. Among his chief works are *Concise Critical Comments on the Holy Bible* (1865), *Grammatical Analysis of the Scriptures* (Hebrew, Chaldee, and Greek, 1885), and an *Analytical Concordance to the Bible* (1886).

Young, THOMAS (1773-1829), English physicist and Egyptologist, was born at Milverton, Somersetshire. He discovered the interference of light, there-

by establishing the undulatory theory; but the theory was not generally accepted until re-advanced by Fresnel. In Egyptology Young was the first to publish a translation of the inscriptions on the Rosetta stone, and to discover the symbolic nature of some of the demotic (cursive) characters. These and other important conclusions were embodied by him in the article 'Egypt' in the *Encyclopædia Britannica* (1818 ed.). His *Course of Lectures on Natural Philosophy* (1807) remains a standard work. See Peacock's *Life* (1855), Gurney's *Memoirs* (1831), and Pettigrew in *Medical Portrait Gallery* (1840).

Young England, the epithet applied to a party of young Tory aristocrats opposed to the repeal of the Corn Laws and to other Radical measures (1839-46). They also aimed at a revival of the manners and customs of mediæval times. Lord John Manners (7th Duke of Rutland, 1818-1906), Cochrane Baillie, G. Smythe, and Benjamin Disraeli were among the leaders of the movement, which is illustrated in the last named's novel *Coningsby* (1844), and still more in *Sybil*. See *Life of Earl of Shaftesbury* (3 vols.), and *Political History of England*, vol. xii. ch. 2 (1907).

Young Germany, a school of letters organized in Germany after the emancipation of that country from the despotic rule of the first Napoleon. It endeavoured to reflect the political hopes and aspirations resulting from the spread of liberal ideas throughout Europe. The failure of the revolution of 1848 caused the dismemberment of the organization. Among the chief exponents of Young Germany were Heine, Börne, Gutzkow, Laube, Heller, and Kühne. See *Cambridge Modern History*, xi., ch. 15 (1909).

Younghusband, SIR FRANCIS EDWARD (1863), British Indian political officer, was born at Murree in India. In 1886 he travelled in Manchuria, and returned (1887) to India across Eastern Turkestan. After being British political officer at Hunza (1892) and at Chitral (1893-4), he was appointed political agent in Harauti and Tonk, Rajputana (1898), the interval having been partly occupied in the Transvaal and Rhodesia (1896-7). In June 1903 he was appointed the British commissioner for negotiating with China a settlement of the relations between India and Tibet, and was at the head of the expedition which in the following year forced its way to Lhasa. In 1906 he went to Kashmir as British resident. He is the author of *The Heart of a Continent: A Narrative of Travels in Manchuria, across the Gobi Desert, through the Himalayas, the Pamirs, and Chitral, 1884-1894* (1896); *The Relief of Chitral* (1895); *South Africa of To-day* (1898); and *Kashmir* (1909).

Young Ireland, the name given to a political party in Ireland, founded in 1848 by Thomas Osborne, C. Gavan Duffy, Thomas Davies, and W. Smith O'Brien, with the object of uniting both Roman Catholics and Protestants in a supreme effort to separate Ireland from the British crown. It differed from the 'Old Ireland' party, which was organized on a sectarian basis, and sought the aid of Roman Catholics alone in the breaking of the union. The proceedings of the 'Young Ireland' party led to a number of state trials. See Duffy's *Young Ireland* (1880), and *Cambridge Modern History*, xi., ch. 1 (1909).

Young Italy, a political association formed at Marseilles in 1831 by Mazzini, the Italian agitator and patriot. It aimed at the creation of a free, independent,

and united Italy, under a representative form of government. It ceased to be an active organization after 1848. See *Cambridge Modern History*, xi., ch. 4 (1909).

Young Men's Christian Association, better known as 'Y.M.C.A.', was founded in London in 1844 by George Williams, in St. Paul's Churchyard. The idea, however, had been put into practice as early as 1632, when some of the apprentices in London met early on Sunday mornings for prayer and the study of God's Word. The movement spread, particularly in the Church of England, and at the beginning of the 18th century upwards of forty such societies were in existence. It was one of these which met at Oxford, and, by attracting first Charles and then John Wesley, gave rise to the great Methodist revival. Its unvarying purpose is to encourage young men in Christian living, good citizenship, and dependable and efficient business service. In the World's Alliance there are now approximately 8,500 affiliated associations in more than 45 countries, with an enrolled membership of nearly 1,000,000. The official headquarters were for long at Exeter Hall, Strand, London, which was purchased in 1881; but through the liberality of Sir George Williams's heirs, his house at 13 Russell Square was offered for headquarters to the Y.M.C.A. and accepted in 1906. A large new Young Men's Club in Tottenham Court Road is in progress. The Young Men's Guild, the Guild of Christian Workers, and even the Christian Endeavour Association, are movements which, directly or indirectly, have emanated from the Y.M.C.A.

Young People's Society of Christian Endeavour. See CHRISTIAN ENDEAVOUR SOCIETIES.

Youngstown, city, Ohio, U.S.A., co. seat of Mahoning co., on Mahoning R., 65 m. S.E. of Cleveland. Its manufactures are principally iron and steel. Pop. (1910) 79,066.

Young Turk Party. See TURKEY.

Young Women's Christian Association, otherwise known as Y.W.C.A., is an organization corresponding to that of the Y.M.C.A., founded in 1855, and seeks the same ends in the moral, spiritual, and social well-being of young women. The British membership numbers 102,500, including 15,000 in London, while there are 500,000 members resident throughout the world. It has its headquarters at 26 George Street, Hanover Square, London. The GIRLS FRIENDLY SOCIETY was founded for the purpose of drawing girls resident in great centres into closer union for mutual protection, and also mutual help in the way of obtaining situations, as well as 'for promoting purity, dutifulness, temperance, thrift, and fidelity.' Branches exist in the United Kingdom in 1,400 places, with a membership of 160,000, and the organization has been extended to the Continent, Australia, America, New Zealand, India, and Africa.

Ypres (Flem. *Yperen*), anc. tn., prov. W. Flanders, Belgium, 32 m. by rail S.S.W. of Bruges; has manufactures of lace, linen, and thread, and a large butter market. The Cloth Hall and St. Martin's Church (formerly a cathedral) both date from the 13th century. Ypres was a flourishing linen-manufacturing town in the 14th and 15th centuries. Pop. 17,000. It is said to have had a pop. of 200,000 in the 14th century.

Ypsilanti, city, Washtenaw co., Michigan, U.S.A., in Lower Peninsula, on Huron R., 30

m. W. of Detroit. Pop. (1910) 6,230.

Ypsilanti Family, a noble Greek family of Fanariot descent, originally from Trebizond, who acquired great wealth and influence at Constantinople. ALEXANDER (1725-1805) was governor of Walachia (1774-82 and 1790-2), and was put to death at Constantinople for plotting the deliverance of Greece from the Turks. His son CONSTANTINE (1760-1816) was governor of Moldavia (1799) and of Walachia (1802-5). After the treaty of Tilsit (1807) he went to Kiev in Russia, where he devoted himself to literature. His son ALEXANDER (1792-1828) entered the Russian service, fought against Napoleon in the campaign of 1812, took part in the Greek revolution of 1821, but was defeated by the Turks at Dragashan (N.E. of Craiova), and died in Vienna. His younger brother DEMETRIUS (1793-1832) assisted his brother to secure Greek independence. He behaved gallantly at Tripolitza (1820), but was unfortunate in the Morea in the campaign of 1821. However, in 1822 he was elected president of the Greek legislative council.

Yriarte, CHARLES ÉMILE (1832-98), French author, a native of Paris, became (1856) inspector of national buildings and (1862) editor of *Le Monde Illustré*. His works include *Goya* (1867), *Venise* (1877), *Florence* (1880), *Françoise de Rimini* (1882), *Matteo Civitani* (1885), *Paul Véronèse* (1888), *César Borgia* (1889), *Millet* (1885), *Fortuny* (1886), and *Autour des Borgia* (1890), most of them translated into English.

Ysaye, EUGÈNE (1858), Belgian violinist, was born in Liège, Belgium. He began to tour in 1878, first appeared in London in 1889, and for some years from 1890 was principal professor of violin in the Conservatorium at

Brussels. He is regarded as one of the greatest living exponents of classical and virtuosic violin music.

Ysolde, or ISEULT. See TRISTAN.

Ysopet ('little Æsop'), the title in the middle ages of a collection of old French fables. The chief of these was that of Marie de France, who lived in England in the reign of Henry III., and wrote a form of verse which was a link between the *Fabliau* and the *Roman de Renart*. The collection was edited by Roquesfort (1820). Another collection was the *Ysopet of Lyons*, edited by Förster (1882).

Yssel. See IJSSEL.

Yssingeaux, comm., France, in Haute-Loire dep., 57 m. s.s.w. of Lyons; manufactures ribbons and lace. Lead occurs in the vicinity. Pop. 7,700.

Ystad, seapt. tn., Malmöhus gov., Sweden, on s. coast, 34 m. E.S.E. of Malmö; has flour, saw, and sugar mills, iron foundries, tobacco, bacon, match, and chicory factories, and chemical works, and exports molasses, fish, and eggs. The harbour is one of the best on the s. coast of Sweden for shipping of moderate size. Pop. (1911) 11,305.

Ystrad yfodwg. See RHONDDA.

Ytterlännäs, comm., Sweden, in Västernorrland gov., 47 m. N.N.E. of Sundsvall. Pop. (1911) 6,230.

Yttrium, Yt, 89.0, an element (sp. gr. 3.8) or possibly a mixture of elements, of the rare earths. It is characterized by its spark and phosphorescent spectrum, and is said to be a component of the 'glower' rods used in the Nernst incandescent electric lamp.

Yuan Shih-kai (1860), Chinese statesman, a native of the prov. of Honan. Adopting the military profession, he went in 1882 with

a Chinese detachment to the aid of the King of Korea, who was threatened with an insurrection. There he became imperial president, a post he only vacated when, in consequence of the war with Japan (1894-5), the Chinese were expelled from Korea. In 1899 he was made governor of Shantung, and set himself with relentless vigour to suppress the Boxer movement. To his conduct the Europeans in Peking owed their lives, and the empire its existence. In 1901 he was made viceroy of Chi-li on the death of Li Hung-chang. He steadily rose in favour with the old empress-dowager, but in 1909 his enemies secured his overthrow and he retired. On the outbreak of the rebellion in October 1911, however, the absolute necessity of having a strong man at the head of affairs was demonstrated, and the court humbly requested his return to active life. Constitutional government and other reforms were granted, and Manchus excluded from all offices. Yun Shih-kai was immediately appointed to the highest office as premier and also commander-in-chief of the imperial forces at the front.

Yucatan. (1.) Peninsula of Central America, jutting N. into the Gulf of Mexico. It includes the Mexican states of Campeche and Yucatan, as well as parts of British Honduras and Guatemala. With an average breadth of about 200 m., it stretches over 250 m. N. and S. Area, 55,000 sq. m. Pop. about 440,000. (2.) State of Mexico, in N.E. of peninsula of same name, covers an area of 35,203 sq. m. Agriculture and stock-raising are the chief industries. Henequen is the leading agricultural product. Sugar, tobacco, vanilla, and dye and cabinet woods are also produced. Pop. (1910) 337,020. Merida is the capital.

Yucca, a genus of American plants belonging to the order Liliaceæ. They bear many-flowered panicles of large showy flowers, and usually thick lanceolate leaves, clustered at the summit of the woody caudex. Many species are cultivated, either in the greenhouse or in the open air, a light rather rich soil being the desirable compost. *Y. filamentosa* and *Y. aloifolia* are known as 'Adam's needle' and 'Eve's thread' from their sharp pointed leaves with threads hanging from their edges.

Yuchi. See UCHI.

Yukaghirs, Siberian aborigines, a division of the Mongolic family. They are now reduced to about 1,500, centred chiefly in the Indigirka and Yana basins. The Yukaghirs have invented a curious symbolic graphic system, in which the signs are carved with a sharp knife out of fresh birch-bark.

Yukon. (1.) Territory of Canada, bounded N. by the Arctic Ocean, S. by British Columbia, and W. by Alaska, with an area of 206,430 sq. m., carved in 1898 out of the Mackenzie district for the purpose of administering the gold regions of the Yukon, which first became generally known in 1896 when the phenomenal gold riches of Bonanza Creek were discovered. The output of gold reached a maximum (£4,455,000) in 1900. From 1896 to 1910 the total production of gold was valued at some £27,000,000, the value for 1910 being about £910,000. Coal is also found. Steamers ply regularly from Lake Bennett (on the frontier) to Dawson, the capital; and a railway (112 m. long) runs from Skagway on Lynn canal, an inlet of the Pacific, to White Horse on the Lewes R., 280 m. S.S.E. of Dawson. The gold fields, near Dawson, are known as Klondike. (2.) River, N. America, in terri-

ories of Yukon and Alaska; has a drainage area of 330,000 sq. m., and is formed by the Lewes and Pelly Rs. It rises about 15 m. from Dyea inlet, and after passing through Lake Bennett flows W., with a big N. curve, to the Bering Sea, its length being about 2,300 m. Its delta has an area of 9,000 sq. m.; but of the twenty-six mouths only the most northerly is navigable. Steamers ascend the Yukon from the mouth to Dawson, and descend from Lake Bennett to the same town; the period of navigation lasts, however, only from the end of June till the end of September.

Yule. See CHRISTMAS.

Yule, SIR HENRY (1820-89), British geographer, was born at Inveresk, near Edinburgh, and at twenty joined the Bengal Engineers. In 1855 he was made under-secretary to the Indian Public Works Department. His works include *Book of Ser Marco Polo* (1871; 3rd ed., with Memoir by his daughter, 1903), *A Narrative of the Mission to Ava in 1855* (1858), and *Hobson-Jobson, a Glossary of Anglo-Indian Words and Phrases* (1886). He also brought out for the Hakluyt Society editions of *Mirabilia Descripta—The Wonders of the East*, by Jordanus (1863); *Cathay and the Way Thither* (1866).

Yumas, North American aborigines, who give their name to a distinct ethnical and linguistic family. They are called also Cuchans, and formerly occupied both banks of the Colorado above the river Gila confluence in Arizona and the San Diego district, California, but are now mostly located in California (700) and Arizona (700). In 1900 the natives of Yuma stock numbered altogether 1,400. See R. G. Latham's *Opuscula* (1860) and J. W. Powell's *Indian Linguistic Families* (1891).

Yün-nan. (1.) Prov., China (Marco Polo's Caragan); area, 146,680 sq. m. N. Yün-nan consists of wind-swept downs, at an altitude of from 4,000 to 7,000 ft., between low ranges of mountains, and intersected by deep ravines, hiding rivers which not infrequently follow subterranean courses. Cart traffic exists, but roads are bad. In W. Yün-nan the country is more mountainous, the rivers are deeper, rendering communication across them almost impossible. On the s.w. and w. the descent from the centre of the province is easier. Large lakes are not infrequent. Excellent crops are obtained of rice, maize, buckwheat, and other grains, but cotton has to be imported. Opium was largely cultivated and exported until the anti-opium edict of 1906. The tin and copper mines are of well-tested repute. Coal and iron are common, and are easily obtained; galena, mercury, and gold are also found, and brine wells are worked. The entire transit trade through Tong-king is between Yün-nan and Hong-kong, the imports in 1910 being valued at £487,004, and the exports from Yün-nan at £915,612, of which £883,101 represented tin from the mines at Kochiu. The total trade with Europe in 1910 amounted to only £66,504. Pop. 12,330,000. See A. Little's *Across Yün-nan* (1910). (2.) Or YUN-NAN FU, city of China, cap. of the above prov., in about 25° 3' N. and 102° 42' E., and about 500 m. by rail N.N.W. of Hai-phong. The city is surrounded by walls and is intersected by canals. Since the opening of the railway from Tong-king in 1910 a fresh impetus has been given to trade. Pop. estimated at about 100,000.

Yuryev, or YURIEV, formerly DORPAT, tn., Livonia gov., N.W. Russia, 140 m. N.E. of Riga. It has a university (founded by Gus-

tavus Adolphus in 1632, closed in 1710, reopened in 1802, Russified under Alexander III.), with about 2,700 students and a library of 240,000 volumes; an observatory in lat. 58° 22' 47" N. and long. 26° 43' 18" E.; remains of old pagan citadel, afterwards the episcopal palace; a ruined cathedral, a fine example of northern Gothic brick-work, destroyed by fire in 1624; and a town hall, with a fine picture gallery. Pop. 42,500.

Yusafzais, an Afghan people, some semi-independent in the hills on the north-west frontier of British India, some settled in the Peshawar district. There are two main sections, Mandan and Yusaf. The total number is estimated at from 250,000 to 700,000. See A. H. Keane's 'Afghan Ethnology,' *Index Geographicus Indicus* (1881).

Yusuf-ibn-Tashfyn. See ALMORAVIDES.

Yuzgat, or YOZGAD, tn., vilayet of Angora, Asia Minor, 85 m. N.N.W. of Kaisarieh. It is famous for its horses. Pop. 15,000.

Yverdon (Lat. *Eburodunum*), tn., Switzerland, canton Vaud, at s.w. end of L. Neuchâtel, 20 m. by rail n. of Lausanne. From 1805-25 Pestalozzi had an educational establishment in the 12th-century castle, now occupied by the municipal school, museum, and library. The watering-place of the same name is near by. Pop. (1910) 8,626.

Yvetot, tn., dep. Seine-Inférieure, France, 20 m. N.W. of Rouen; has manufactures of silk, linen, and cotton goods. Béranger, in satirically singing of Napoleon as 'le Roi d'Yvetot,' was making use of the usual designation of the lords of the tiny principality of Yvetot till 1681. Pop. 7,100.

Y. W. C. A., Young Women's Christian Association.

Yzeure, comm., France, in Allier dep., an eastern suburb of Moulins. Pop. 6,100.

Z

Z represents voiced *s*. It has never been much used in English, except for foreign words; the sound *z* is generally represented by *s*. In 'azure' and other words *z* has the value *zh*. (See *S*.) The obsolete letter **Z** is a form of *g*. In the Greek and Semitic alphabets *z* is the seventh letter. It was the last addition to the Latin alphabet, and so put at the end. It was borrowed by the Romans to represent Greek words, and was rarely used by them. In the Greek alphabet it is believed to have had a compound value, both *dz* and *zd*. The early Semitic form is **𐤆**. **Z** is the same, written without lifting the pen. Hebrew **ז** has lost the lower stroke. The addition of a flourish has made *z* into **3**. French *ç* is a special form of *z*, as the name cedilla implies. The Greek name *zeta*, Latin and English *zed*, does not correspond to the Semitic name, which is *zayin*. It is the Semitic name for the eighteenth letter of the alphabet, *sade*, which the Greeks called *san*. It is generally assumed that the Greeks confused the names of the sibilants and dropped the name *zayin*. It is, however, open to suppose that the Semites altered the name of *san* to *sade* after it was completely differentiated from *shin*, and later than the date of the Greek borrowing of the alphabet. In that case *zayin* is a later name; its meaning is uncertain. The root of the word *sade* means 'to fish.'

Zaandam, incorrectly SAARDAM, tn., Netherlands, prov. N. Holland, 6 m. by rail N.W. of Amsterdam; with oil mills, saw-mills, and factories for paper,

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cement, and colours. Here Peter the Great of Russia (1697) learnt shipbuilding. Zaandam was formerly the chief Dutch port for Greenland whale fishery. Pop. (1910) 24,579.

Zabern, tn. in Alsace, Germany, on the Zorn, a trib. of the Rhine, and on the Marne and Rhine canal, 20 m. W.N.W. of Strassburg. There are manufactures of agricultural implements. Pop. (1910) 9,153.

Zabians and Zabism. See SABEANS.

Zabie, tn., Galicia, Austria, 55 m. W. by S. of Czernowitz. Pop. (1911) 8,909.

Zabrze, tn. in Silesia, Prussia, 8 m. W. of Königshütte and 95 m. S.E. of Breslau. It has large coal mines, smelting works, quarries, and wire, glass, and chemical works, and breweries. Pop. (1910) 63,225.

Zacapoaxtla, tn., Mexico, in state of and 75 m. N.E. of Puebla. Pop. 12,000.

Zacatecas. (1.) A central state of Mexico, bounded N. by Durango and Coahuila, E. by San Luis Potosi, S. by Aguascalientes and Jalisco, and W. by Jalisco and Durango. The state belongs wholly to the great central plateau of Mexico, its average elevation being about 7,700 ft. It is rich in minerals. Silver is extensively mined, and gold, mercury, copper, iron, zinc, lead, bismuth, antimony, and salt are found. Cereals, sugar, maguery, and fruit are grown. Area, 24,757 sq. m. Pop. (1910) 475,863. The chief towns are Zacatecas (the capital), Sombrerete, and Fresnillo. (2.) Tn., cap. of state Zacatecas, Mexico, 115 m. N.W. of San Luis Potosi; contains a

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cathedral, mint, and institute of sciences. The chief industry is the reduction of silver ore. Pottery is made. Pop. (1910) 25,905.

Zacatecoluca, tn., Salvador, cap. of La Paz dep., 28 m. s.e. by E. of San Salvador. Pop. 15,000.

Zacatlan, or XICOTLAN, tn., Mexico, 60 m. N. by E. of Puebla. Pop. 11,000.

Zacharias, POPE (741-752), a Greek by birth, succeeded Gregory III. He was a man of great ability and piety and strong personal magnetism. He impressed his authority on Liutprand and Ratchis, kings of the Longobards, and was instrumental in the deposition of Childeric III. in favour of Pepin (Pippin).

Zacynthus. See ZANTE.

Zadkiel, the name adopted by Richard James Morrison (1794-1874), a retired British naval officer, as the compiler of a prophetic *Almanac*, started in 1830, which soon commanded a very great sale. He was skilled in Hebrew, mathematics, astronomy, and occult science, especially the reading of the crystal ball.

Zadonsk, tn., Russia, in gov. of and 60 m. N. by W. of Voronezh, on the Don. Pop. 8,300.

Zaffarines, or CHAFFARINAS, a group of three small islands, Morocco, 6 m. N.W. of the mouth of the Muluya. They belong to Spain, and are fortified. Pop. 650.

Zaffre, a crude oxide of cobalt, obtained by heating cobalt ore in a current of air. It is used to prepare smalt and stain glass blue.

Zafra, tn., Spain, in prov. of and 40 m. s.w. of Badajoz. It has an interesting old castle. Pop. 6,200.

Zagarolo, tn., Italy, in prov. of and 20 m. E.S.E. of Rome. Pop. 5,300.

Zagazig, tn., cap. of prov. Charkieh, Lower Egypt, 47 m. by rail N.N.E. of Cairo, the centre of cotton and grain trade. The

ruins of Bubastis are situated 1 m. to the S. Pop. (1907) 34,999.

Zagoskin, MIKHAIL NIKOLAI-VITCH (1789-1852), Russian dramatist and novelist, born at Ramzay, Penza; was at first a government clerk in St. Petersburg, then joined the army, was wounded at Potolsk, and was present at the siege of Danzig. His comedy *Prokaznik* ('The Wag') was a great success. He wrote a number of plays, and a romance which caused some sensation—*Yurii Miloslavsky* (1829; Eng. trans. *The Young Muscovite*, 1834). In 1820 he was appointed director of the theatre at Moscow, and in 1842 director of the armory of the Kremlin.

Zagreb, Croatia. See AGRAM.

Zagreus, in Greek mythology, the name of the Dionysus of the mysteries; he was begotten by Zeus in the form of a dragon from Persephone. Zeus made him ruler of the world, but the Titans tore him in pieces; Athena then took his heart to Zeus. Zeus swallowed it, and afterwards brought forth the new Dionysus. The Titans were consumed by the lightning of Zeus; from their ashes sprang the race of men. See Walter Pater's *Greek Studies* (1901), Abel's *Orphica*, J. E. Harrison's *Prolegomena to the Study of Greek Religion* (1908).

Zahleh, tn., Syria, 33 m. N.W. of Damascus, on the E. slope of Lebanon. Pop. 15,000.

Zahn, THEODOR (1838), German theologian, was born at Mörs in Prussia. He became professor of theology in Kiel (1871), in Erlangen (1878), and in Leipzig (1888). He was joint-editor with Gebhardt and Harnack of the *Patrum Apostolicorum Opera*, in 3 vols. (1876-8). His works on the canon are *Forschungen zur Geschichte des Neutestamentlichen Kanons* (6 vols. 1881-1900)—this includes the *Diatessaron* of Tatian—and *Geschichte des Neutesta-*

mentlichen Kanons (1888-92). He has written, further, *Einleitung in das Neue Testament* (2 vols. 1897-9), *Skizzen aus dem Leben der alten Kirche* (1894), and *Epiktet* (1893).

Zaila. See ZEYLA.

Zaimis, ALEXANDER, Grecian statesman, was prime minister (1897-9) after the Turkish war, and again from 1901 to 1902. On September 1906, with the consent of the Powers, he was appointed high commissioner to Crete in succession to Prince George of Greece. He retired in 1911, when the powers announced that they did not intend to refill the post.

Zaire. See CONGO.

Zaisan, lake, in Semipalatinsk prov., Russian Central Asia, crossed by 48° N. lat. and 84° E. long. It receives the White Irtish at its eastern end, and the Irtish issues from it in the N.W. Its fisheries are important. It has a maximum depth of 50 ft., a length of 65 m., and an area of 700 sq. m.

Zakka Khels. See BAZAR VALLEY.

Zakopane, tn., Galicia, Austria, 52 m. S. of Cracow. It has iron-works and paper mills, and is frequented for its mineral waters. Pop. (1911) 7,600.

Zala-Egerszeg, tn., Hungary, cap. of the co. of Zala, 62 m. S. by E. of Odenburg. Pop. 9,800.

Zalamea de la Serena, tn., Spain, in prov. of and 75 m. E. by S. of Badajoz. Pop. 5,600.

Zalamea la Real, tn., Spain, in prov. of and 32 m. N.N.E. of Huelva. Pop. 7,300.

Zalenze, tn., Silesia, Prussia, 3 m. S.E. by S. of Königshütte. Pop. (1910) 17,046.

Zaleszczyki, tn., Galicia, Austria, 37 m. N. by W. of Czernowitz. Pop. (1911) 4,994.

Zaleucus, the earliest law-giver of ancient Greece, belonged to the city of Locri Epizephyrii in S. Italy. His legislation probably dates in the 7th century B.C.

Zalozce, tn., Galicia, Austria, 20 m. N. by W. of Tarnopol. Pop. (1911) 7,366.

Zalt-Bommel. See BOMMEL.

Zama, tn. in Numidia, N. Africa, situated some 75 m. S.W. of Carthage; the scene of Scipio's decisive victory over Hannibal in 201 B.C., which ended the second Punic war.

Zambales, prov. Luzon, Philippines, in the China Sea, extending S. 120 m. from the Gulf of Lingayen. Area, 2,120 sq. m.; dependent isl., 50 sq. m. The surface is mountainous, Mount Iba having an alt. of 5,262 ft. Agriculture is the chief industry, and rice and wheat are the principal crops. Copper and coal are mined. Pop. 105,000. Iba, the capital, is 85 m. N.W. of Manila.

Zambezi, a large river of south-central Africa. Rising on the border of the Belgian Congo, in lat. 11° 21' 3" S. and long. 24° 22' E., approximately, at an altitude of nearly 5,000 ft., it flows south and south-east through north-western Rhodesia for fully 600 m. to the Victoria Falls, the largest waterfalls in the world, being 1,860 yds. broad and 400 ft. high. A scheme to harness the falls and supply electrical power to the Rand is in contemplation. The gorge below is spanned by a railway bridge (opened 1905) 650 ft. long and 420 ft. above river-level. From this point the river flows north-east and east for 900 m. to the Kebrabasa Falls in Portuguese territory, where it descends from the central plateau at a distance of 400 m. from the sea. In its lower course it receives the drainage of Lake Nyasa by the Shiré R., and, running south-eastwards through low country, enters the Indian Ocean by seven chief branches, the most important being the Chinde R. Sandbanks are troublesome, but stern-wheel steamers



Railway Bridge at Victoria Falls, Zambesi River.

ply up to Tete, and to Chiromo on the Shiré R. The middle river is also navigable for vessels of small draught. Its total length is estimated at 2,200 m., and its drainage area at 513,000 sq. m.

Zambezia, a district of Mozambique, or Portuguese E. Africa, occupying the basin of the lower Zambezi. Formerly it extended inland to the limits of Portuguese territory, but upper Zambezia has been detached and formed into the district of Tete. The capital of Zambezia is Quilimane, on the Kwakwa R. As a port it has lost much of its importance, while Chinde, on a mouth of the Zambezi, is progressing. See R. C. F. Maugham's *Zambezia* (1910).

Zamboanga. (1.) District, Mindanao, Philippines, occupying the end of the west peninsula of the island, area, 3,358 sq. m.; and 80 dependent islands, with an area of 128 sq. m. Teak, juniper, and resinous and other valuable woods are abundant. Rice, hemp, coffee, tobacco, sugar-cane, etc., are grown. Pop. 45,000. (2.) The cap. of above dist. is 560 m. s. by E. of Manila. It is an open port, and has fortifications and a naval station. Pop. 3,500.

Zamenhof, LAZARUS LUDOVIC (1859), born at Bielostok, Grodno gov., Russia, is an oculist in Warsaw. He invented the international auxiliary language Esperanto, and has been decorated by the French and Spanish governments for his services in connection with its development. See ESPERANTO.

Zamia, a genus of tropical, palmlike plants belonging to the order Cycadaceæ. They are natives of the W. Indies and of S. and Central America. They bear pinnate leaves, few in number. They are often cultivated in the stove, a light, peaty soil being required.

Zamora. (1.) Province, Spain, on the Portuguese frontier, drained by the Douro and its tributaries; entirely agricultural—the wheat being considered the best in Spain, and the wine highly esteemed. Area, 4,097 sq. m. Pop. (1910) 272,143. (2.) City, cap. of above prov., 40 m. N. of Salamanca; very ancient walled city on Douro R. It has a considerable trade in wine, wheat, and coarse linens. Pop. 16,300. (3.) Town and bishop's see, Mexico, in state of Michoacan, 200 m. W.N.W. of Mexico city. Pop. 10,000.

Zamindar. See ZEMINDAR.

Zamosc, tn., Lublin gov., Russian Poland, 50 m. S.E. of Lublin city; with a fine castle, and houses in the Italian style. Formerly it was one of the strongest fortresses in Poland. Pop. 12,000.

Zanardelli, GIUSEPPE (1826–1903), Italian statesman, born at Brescia; served in the wars of 1848–49 and 1859. In 1861 he was elected a deputy, became minister of public works (1876) and of the interior (1878). He retired from politics to publish the *Avvocato*, but was afterwards appointed minister of justice (1881–3 and 1887–91). The new Italian penal code (1890) was chiefly due to him. He was president of the Chamber (1891–4 and 1898), and afterwards president of the Council (1901–3).

Zancle. See MESSINA.

Zandeh, or A-ZANDEH. See NIAM-NIAM.

Zander Institute. In 1911 a public Zander Institute was opened in Sheffield through the generosity of a private donor (Mr. Edgar Allen). The gift is the outcome of the donor's personal observations during his travels in European countries as to the immense benefits that are obtainable from the use of mechanico-medical apparatus in the treatment of many of the

commoner injuries to which workmen are liable. This is the first fully equipped free institute of its kind to be established in England, and a short account of the origin, aims, and attainments of this institute may be given. Modern medical gymnastics may be said to have originated with Ling, a Swede, born in 1776. Finding the practice of fencing and other gymnastic exercises had completely restored him from being a physical wreck to robust health, his thoughts turned towards applying this experience for the benefit of others. To this end he elaborated a system of gymnastics, and with the co-operation of the Swedish government founded the Royal Gymnastic Central Institute at Stockholm in 1813. The Swedish system or modifications of it are now known and practised all over the world, the course of instruction being very thorough, and occupying a period of at least three years. In 1857 Dr. Zander conceived the idea of employing mechanical apparatus in the practice of medical gymnastics, and after numerous experiments he evolved the scheme which bears his name. In 1855 he founded at Stockholm the first public medico-mechanical institute. These institutes exist largely on the Continent, and more especially in Germany and Sweden. A fully equipped institute contains upwards of seventy different appliances. These may be classified into four groups. Class A comprises apparatus which are set in motion by the muscular action of the patient and are known shortly as 'active movement apparatus.' Class B consists of apparatus driven by steam, gas, or electricity, and may be subdivided into passive movement apparatus proper, and those devoted to mechanical massage in the forms of friction, percussion, vibration,

and kneading. The passive movement machines permit of easy and accurate graduation of movement, and are, when properly applied, quite painless. Class C comprises apparatus and machines mainly concerned in the correction of curvature of the spine, and Class D consists of measuring apparatus which regulates the degrees of deformity and enables the surgeon to determine accurately from time to time what improvement, if any, has resulted from treatment. There is a very wide field of usefulness for the Zander method of treatment. It is largely because of their value in dealing with accident cases that Zander institutes have recently come into so much prominence in Germany. Not only has there been a large increase in their numbers, but they are constantly receiving additional recognition and financial support from municipalities and other public bodies. Those who have taken an opportunity of studying the principles and practice of a Zander institute are, without exception, strongly convinced of the great value of such an institution. The experience of the Sheffield institute will be followed with great interest in other centres.

Zandvoort, seaside resort, Netherlands, prov. N. Holland, on North Sea, 6 m. by rail w. by s. of Haarlem. Pop. (1910) 3,794.

Zanella, GIACOMO (1820-88), Italian poet and literary historian, was born at Chiampo, near Vicenza, and was engaged in teaching till 1866, when he was called to the chair of Italian language and literature at Padua. He retired in 1876. Those of his poems which aroused most curiosity are the ones dealing, not altogether successfully, with various subjects of a scientific kind (fossils, nature, and science, the Suez Canal); others, however, are marked by beauty of style

and great tenderness. He wrote the history of Italian literature in the 18th and 19th centuries (1885). A *Life of A. Palladio* and an interesting volume on literary parallels also deserve mention. See the preface by Lampertico to the edition of the *Porsie* (1884).

Zanesville, city, Ohio, U.S.A., co. seat of Muskingum co., on Muskingum R., 55 m. E. of Columbus. It has railway shops, and manufactures fire-clay products, cotton and woollen goods, and machinery. Pop. (1910) 28,026.

Zangwill, ISRAEL (1864), English writer, became a teacher in Spitalfields, and subsequently a journalist. He has written novels, essays, poems, and plays, and distinguished himself as a Zionist lecturer. Among his general works are *The Premier and the Painter* (1888); *The Bachelors' Club* (1891); *The Big Bow Mystery* (1892); *The Old Maids' Club* (1892); *Children of the Ghetto* (1892); *Ghetto Tragedies* (1893); *The King of Schnorrers* (1894); *The Master* (1895); *Dreamers of the Ghetto* (1898); *The Mantle of Elijah* (1900); *Ghetto Comedies* (1907); *Italian Fantasies* (1910). Among his plays are *Six Persons* (1892); *Children of the Ghetto* (1899); *The Revolted Daughter* (1901); *Mercy Mary Ann* (1904); *The Serio-Comic Governess* (1904); *Jinny the Carrier* (1905); *Nurse Marjorie* (1906); *The Melting Pot* (1908); *The God of War and the Next Religion* (1911). He is honorary president of the Jewish (Zionist) Territorial Organization for colonizing British E. Africa, and is a strenuous advocate of women's suffrage.

Zante (anc. *Zacynthus*), cap. of isl. of same name, Ionian Is., Greece, on E. coast; has manufactures of carpets, and of gold and silver articles. The island, known as the 'Golden Island,'

forms a nome or dep. of Greece; it is very subject to earthquakes. The exports are currants, soap, and pyrene and olive oils. In 1910 the imports were valued at £48,350, and the exports at £228,856. Area, 277 sq. m. Pop. of isl. 42,000; of tn. 16,000 (including suburbs).

Zanzibar. (1.) Sultanate under British protection, a ten-mile-deep strip of the coast of British E. Africa, from the mouth of the Umbu to Kipini on the Ozi, together with the isls. of Zanzibar, Pemba, and others, and the mainland town of Kismayu. The chief ports are Zanzibar, Mombasa, and Kismayu. Cloves and copra are the principal exports. The Imams of Muscat made themselves masters of Zanzibar between 1698 and 1807. Area, 1,020 sq. m. Pop. 200,000. (2.) Island, off East African coast, separated from German E. Africa by a channel 20 m. wide. It has an area of 640 sq. m. It is traversed from N. to S. by undulating hills, rising to nearly 900 ft. in the N., and is exposed to the full influence of the Indian Ocean. The mean yearly temperature is about 80° F., and the mean annual rainfall 61 in. The heat is oppressive only in December and January. The chief crops are sorghum, rice, cloves, chillies, and cocoanuts. There is also a promising cultivation of tea, coffee, and vanilla. In 1910 the imports were valued at £993,031, and the exports (chiefly cloves, copra, ivory, piece goods, and grain) at £1,033,467. The population was 114,069 in 1910. (3.) Town, cap. of isl. of Zanzibar, the principal port on the E. coast of Africa, on a low-lying peninsula, projecting from the W. coast. The buildings include the sultan's palace, a French hospital, an English hospital, an English church, Hindu temple, the old fort, and a government ship.

repairing factory. It is connected by submarine cable with Aden, Mauritius *via* Mahé (Seychelles), and Delagoa Bay *via* Mozambique. Pop. 35,000. See R. N. Lyne's *Zanzibar in Contemporary Times* (1905); Ethel Younghusband's *Glimpses of East Africa and Zanzibar* (1910); and S. Playne's *British East Africa* (1910).

Zaparos, South American aborigines, formerly powerful in Ecuador. They occupy a large tract of country between the rivers Napo and Pastaza. Although described as docile, hospitable, and friendly to Europeans, the Zaparos are in a state of continual feud amongst themselves, combining only against the Jivaros and other enemies. Physically they are of somewhat Mongolic aspect, with round, flat features, small, oblique-set eyes, small, thick nose and lips, beardless chin, and light coppery colour. They speak a stock language of simple structure.

Zapatoca, tn., Colombia, 160 m. N.N.E. of Bogotá; lead is mined, and tobacco and indigo are grown. Pop. 8,000.

Zapolya, or ZAPOLY, Hungarian family. STEPHEN (d. 1499) distinguished himself under Matthias Corvinus, succeeded in expelling the son of Casimir IV., king of Poland, who endeavoured to secure the throne of Hungary, defeated the Turks and the imperialists, and became governor of Austria (1483). His son JOHN (1487-1540), voivode (1510) of Transylvania, quelled the revolt under Dosza (1514), and was proclaimed king of Hungary (1526). Defeated by Ferdinand of Austria (1528), he fled to Poland, but made peace (1538). His son JOHN SIGISMUND (d. 1571), who succeeded in 1540, was forced (1551) by Sultan Solyman to change his title of king for that of voivode of Transylvania, and abdicated in 1570.

Zaporogians. See COSSACKS.

Zapotecs, one of the chief civilized nations of Mexico, who in pre-Columbian times were a powerful kingdom in the present state of Oajaca, which, however, was overthrown by the Aztecs towards the close of the 15th century. Their general culture is attested by the ruins of their palace at Mitla, one of the very finest monuments in the New World. They are still numerous in E. Oajaca, where they speak a cultivated and highly polysynthetic stock language.

Zapotlan, or ZAPOTLAN EL GRANDE, tn., Mexico, in state of Jalisco, 70 m. s. by w. of Guadalajara. Pop. 18,000.

Zapotlanejo, tn., Mexico, in state of Jalisco, 20 m. E. by N. of Guadalajara. Pop. 20,000.

Zara (anc. *Iadera*), seapt. tn. and cap. of Dalmatia, Austria, on the Adriatic, 72 m. N.W. of Spalato; has manufactures of maraschino, flour, wax, and glass. There are Roman remains; the cathedral dates from the 13th century. Zara gives title to an archbishopric of the Roman Catholic Church, and to a bishopric of the Orthodox Greek Church. Pop. (1911) 36,600.

Zarafshan. See ZERAFSHAN.

Zaragoza. See SARAGOSSA.

Zaraisk, tn., Russia, in gov. of and 40 m. N.W. of Ryazan. Pop. 8,000.

Zaransk, tn., Russia, in gov. of and 70 m. N. of Penza. Pop. 13,800.

Zarathusthra. See ZOROASTER.

Zaria, central prov. of Northern Nigeria, watered by the Kaduna. The chief product is cotton. Area, 22,000 sq. m.; pop. 340,000. The cap. is Zaria, in lat. 11° 5' N. and long. 7° 42' E., and 138 m. N.E. of Zungeru. In 1911 a railway, 400 m. long, was completed between Baro on the Niger, Zaria, and Kano. At Minna, about 77 m.

N. by E. of Baro, this line joins the railway to Zungeru, Jebba, Ilorin, and Lagos (430 m. from Zungeru).

Zarskoe. See TSARSKOESELO.

Zaslavi, tn., Russia, in Volhynia gov., 80 m. W. by S. of Zhitomir. It has manufactures of woollens, paper, and sugar. Pop. 12,700.

Zastron, tn., Orange Free State prov., South Africa, 100 m. S.S.E. of Bloemfontein, and 20 m. from the border of Basutoland, in an agricultural district. Pop. 2,700.

Zautla, tn., Mexico, in state of and 50 m. N.E. of Puebla. Pop. 7,400.

Zawoja, tn., Galicia, Austria, 32 m. S.S.W. of Cracow. Pop. (1911) 6,025.

Zayetchar, or ZAITCHAR, tn., Servia, on the river Timok, 33 m. W. by S. of Widin. Pop. 8,400.

Zbaraz, tn., Galicia, Austria, 14 m. N.E. of Tarnopol, near the frontier of Russian Poland. Pop. (1911) 9,941.

Zdunskawola, tn., Russian Poland, in gov. of and 43 m. E.S.E. of Kalisz. Pop. 16,000.

Zea. See CEOS.

Zea, FRANCISCO ANTONIO (1770-1822), Colombian naturalist. born at Antioquia; was one of the founders of the republic of Colombia, of which he was vice-president. From 1820 to 1822 he was the agent of the Colombian government in England.

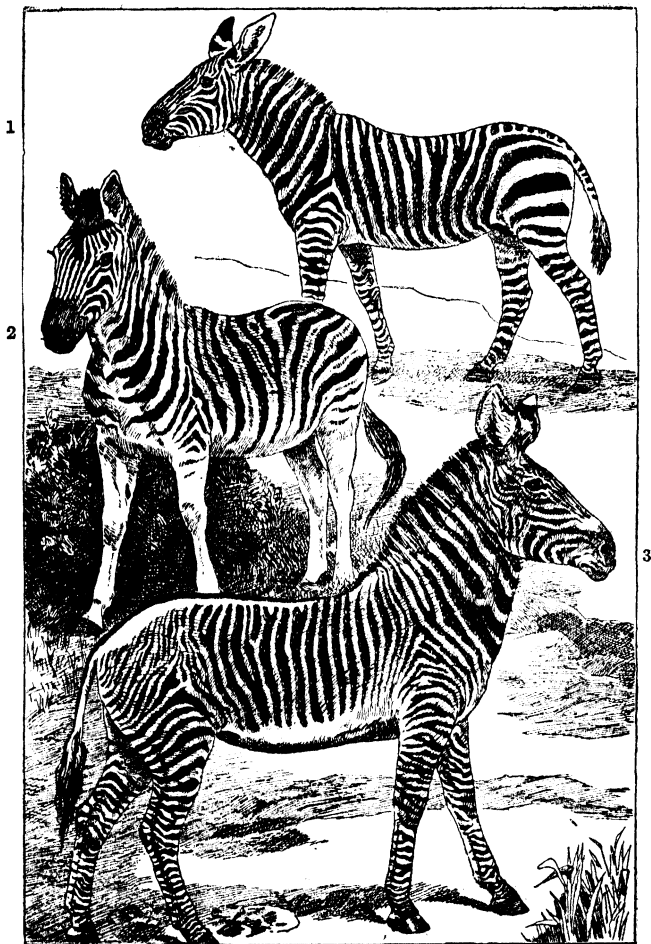
Zea Grain. See MAIZE.

Zealand. See SJÆLLAND and ZEELAND.

Zealots, a Jewish party which originated in the reign of Herod the Great. Josephus (*Ant.* xviii. 1, 6) calls them the fourth party (besides the Pharisees, Sadducees, and Essenes), that of the nationalists, who revived the Maccabæan movement. Their headquarters were the Galilean highlands. A strong party in the Sanhedrin was in sympathy with their aspi-

rations. Ezekias, the leader of the Zealot guerilla bands, was executed by Herod; but Judas, one of his sons, again raised the standard of revolt on the accession of Archelaus. Twice he failed, and his two sons were crucified (46). A third son, Menahem, who was chief of the Sicarii, the most fanatical section of the Zealots, died under torture; while Eleazar, a fourth son, was slain in battle. Simon, one of the twelve apostles, once belonged to the party of the Zealots (Luke 6: 15).

Zebra, the type of a group of striped horselike animals, peculiar to the African continent. In having callosities on the fore limbs only, in the characters of the tail, ears, and hoofs, the zebras approach the asses more nearly than the true horses; but they differ from the asses in the extensive striping of the head and body. The mountain zebra (*Equus zebra*), also called the true zebra, was formerly common in the mountain regions of Cape Colony, but is now confined to certain protected districts in the east. It stands a little over four feet at the shoulder, and is striped over head, legs, tail, and body, with the exception of the under surface and the inner side of the thighs. The stripes are broad, and are black on a white ground. Burchell's zebra (*E. Burchelli*), sometimes, but erroneously, called the quagga, is a plain-dwelling animal, found to the north of the Orange R. In the typical form stripes are absent on the limbs and tail, and there are certain peculiarities in the direction of the stripes. In Shoa and Somaliland there occurs a third species (*E. Grevyi*), formerly confused with the mountain zebra, from which it differs in the height (four feet at the shoulder), and in the great number of the narrow stripes, which occur over



Species of Zebras.

1. Mountain zebra. 2. Rurchell's zebra. 3. Grevy's zebra.

the limbs and tail as well as on the body. Zebras have been domesticated, though with considerable difficulty. They will interbreed alike with the horse and the ass. See Cossar Ewart's *Penicuik Experiments* (1899), and *Guide to Zebras, Hybrids, etc.* (1900).

Zebu. See CEBU.

Zebu (*Bos indicus*), the domesticated ox of India, which differs from the European ox in the presence of a large hump on the withers, the large drooping ears, the enormous dewlap, as well as in coloration and habits. It is usually ashy-gray, but cream, white, and even black varieties occur, as well as forms showing reddish tints. The disposition is gentle, and in India the animals are used for draught purposes. The sacred bulls of India, known as Brahman oxen, which are allowed to wander freely about the bazaars, belong to this species. Humped cattle, which are at least closely related to the zebu, occur in Africa, Madagascar, and China. The voice in all varieties is a grunt; and there is great variation in size.

Zechariah. The original prophecy is in ch. 1-8, and was written by a grandson of Iddo, the head of a priestly family which returned from the exile. Like Haggai, Zechariah began his work in the second year of Darius Hystaspis (520 B.C.). He found the community at Jerusalem discouraged by the difficulties which they met after the return from exile, and neglecting the restoration of the temple because of their temporal wants. Zechariah urged the continuation of this task as the condition of Jehovah's help, and cast his encouraging view of the future into the form of visions. In these he foretold the advent of a Messianic king (whom he perhaps

identified with Zerubbabel). Ch. 9-14 contain a collection of minor prophecies. It is still doubtful how many writers contributed to these, and at what period they wrote. The following sketch must be taken as purely tentative:—Ch. 9:1-11:3. This belongs to the period after Alexander the Great, not earlier than 333 B.C. The word of Jehovah is uttered against Asshur and Egypt—i.e. the Seleucid empire. A Messianic king with a more spiritual work is foretold. Ephraim—i.e. the tribes of the Diaspora—will be restored. Ch. 11:4-17; 13:7-9. All that can be said of the date of this fragment is that it is post-exilic. It deals with the inward condition of the community, about which we know little. The shepherds are the native authorities, especially the successive high priests. Ch. 12:1-13:6, post-exilic. It shows a separation appearing between Judah and Jerusalem. Ch. 14. Later in date than Malachi, and apocalyptic in character. See C. H. H. Wright's *Zechariah and his Prophecies* (1879); K. Marti's *Der Prophet Zacharia der Zeitgenosse Serubbabels* (1892); G. A. Smith's *The Book of the Twelve Prophets*, vol. ii. (1898); W. Nowack's *Die Kleinen Propheten* (1892).

Zechstein, the name given in Germany to the Upper Permian. Its principal member is the Zechstein limestone, which contains many fossil shells belonging to such genera as *Productus*, *Spirifer*, *Strophalosia*, and *Camarophoria*. The copper slate, or Kupferschiefer, which lies beneath the limestone, is a black shale, impregnated with copper ore, and often crowded with remains of fishes and plants, which have been replaced by deposits of copper salts. In the Zechstein, especially in N. Germany, near Stassfurt and Spereberg, there are

enormously valuable deposits of rock salt, with gypsum, carnalite, and kainite. The Magnesian Limestone of the N.E. of England is at the same horizon as the Zechstein.

Zedekiah, the last king of Judah (597-586 B.C.), was the son of Josiah. A vassal of Nebuchadnezzar, he coquetted with Egypt, and so brought about the ruin of Jerusalem and his kingdom (2 Kings 24). Two false prophets likewise bore the ill-fated name—the opponent of Micaiah under Ahab (1 Kings 22: 11-24), and a co-exile of Jeconiah, denounced by Jeremiah (Jer. 29: 21 f.).

Zedoary (*Curcuma zedoaria*), a Himalayan herbaceous plant belonging to the order Scitamineae. It bears carmine-tinged white bracts above, green bracts below, yellow flowers, and variegated leaves. Stove heat is required for its cultivation in Britain. The tubers should be repotted in spring.

Zeebrügge (i.e. Sea Bruges), seapt., Belgium, prov. West Flanders, 7 m. N. of Bruges, of which it is the port. A ship canal (7 m. long) connecting the two was officially opened by King Leopold in 1907. In 1906 a passenger service started between Hull and Zeebrügge.

Zeehan, tn., Montagu co., Tasmania, the centre of the silver-lead mining district, 25 m. N. of Macquarie harbour; has smelting works. Pop. 5,100.

Zeeland, prov. Netherlands, adjacent to North Sea, consists of a group of islands at the mouths of the Maas (Meuse), Waal, and Scheldt (Schelde)—viz. Schouwen, Walcheren, N. and S. Beveland, Tholen, and some smaller ones. These islands, lying for the most part below sea-level, are protected by dikes and embankments. Over 220,000 acres have been won back from the sea by erdiking. The soil is very

fertile. Fishing is carried on. Cap. Middelburg. Area, 690 sq. m. Pop. (1910) 232,515.

Zeerust, tn., Transvaal prov., S. Africa, 149 m. by rail W.N.W. of Johannesburg, in the fertile Marico Valley. Citrus fruits, wheat, and oats are largely produced. The district is rich in minerals; lead is mined at Doornhoek, and zinc at Witkop. Ottoshoop, in the Malmani gold-fields, lies 15 m. S.S.W. Pop. 2,000.

Zehdenick, tn. in Brandenburg, Prussia, 32 m. N. of Berlin. Pop. (1910) 9,718.

Zehlendorf, vil., Brandenburg, Prussia, 8 m. S.W. of Berlin. Pop. (1910) 16,861.

Zeist. See ZEYST.

Zeitun, tn., vilayet, Aleppo, Asiatic Turkey, in a gorge in the Taurus Mts., 25 m. N.N.W. of Marash; has iron mines. Pop. 10,000.

Zeitz, tn., prov. Saxony, Prussia, on r. b. of Weisse Elster, 23 m. S.W. of Leipzig; has manufactures of cotton and woollen goods, machinery, pianofortes, cigars, etc. Coal and mineral oil occur in the vicinity. Pop. (1910) 32,972.

Zelaya, a dep. of Nicaragua, on the E. coast, formerly the Mosquito Reserve. By a treaty signed in 1905, Great Britain (under whose protection the Indians in this region had been since 1860) recognized the absolute sovereignty of Nicaragua over the territory.

Zele, tn., East Flanders, Belgium, 14 m. E. by S. of Ghent. It manufactures cottons and sailcloth. Pop. 14,200.

Zella, tn., Saxe-Coburg-Gotha, Germany, in the Thuringian Forest, 20 m. S. by W. of Gotha. Arms are manufactured. Pop. (1910) 5,691.

Zelle, Hanover. See CELLE.

Zeller, EDUARD (1814-1908), historian of philosophy, was born

at Kleinbottwar in Württemberg. He was (1847) appointed professor of theology at Bern; taught theology at Marburg in 1849. In 1862 he became professor of philosophy at Heidelberg, and was transferred to Berlin in 1872. His *Philosophie der Griechen* (4th ed. 5 vols. 1879-92) is a standard work, and was translated into English (1868-83) under various titles. He also wrote *D. F. Strauss* (1874) and *Friedrich der Grosse als Philosoph* (1886).

Zemindar, literally a landholder: a Persian word introduced into Hindustan by the Mohammedans. A number of villages formed a district, the head man of which was called a *zemindar*. The chief business of the zemindar was to collect the revenues for the government. At present, in Bengal, the zemindars have all the rights of a British landed proprietor, subject to the payment of the land-tax.

Zemstvo, the elective district assembly in Russia, founded in 1864 by Alexander II. There are two zemstvos, the smaller being concerned only with the affairs of a single district, while the larger is elected by the zemstvos of all the districts in a province or government. District zemstvos are indirectly elected, and are made up of nobles and peasants in about equal numbers, together with a few merchants. They meet for about fifteen days once a year. Provincial zemstvos are composed wholly of members of the upper classes. Nominally representative and independent in the administration of their districts, they are yet under direct state control, and the governor of the province has a veto on all resolutions of both bodies.

Zenana, in India the portion of the native house reserved exclusively for the women, thus corresponding to the Moslem

harem. Zenana missions were founded in 1852 to aid the women of India, by means of Protestant female missionaries, and especially female medical missionaries.

Zend. Some authorities apply this term to the ancient Iranian language in which the *Avesta*, or sacred writings of the Zoroastrians, was written. Other authorities assert that Zend is not the name of a language, but means a 'commentary' or translation—*Zend-Avesta* meaning a commentary on the *Avesta*, not the language of the *Avesta*. No name for the language of the Parsee scriptures has yet been found in the Parsee books. The word is generally applied to some Pahlavi translation, commentary, or gloss. The language which now passes by the name of Zend is also called old Bactrian and Eastern Iranian, related to old Persian, and forming, with other Iranian and Indian languages (e.g. Sanskrit), the Aryan or Indo-Iranian group.

Zend-Avesta, the sacred books of the Parsees. Mingled with treatises on astronomy, medicine, botany, agriculture, philosophy, etc., these books contain prayers, moral precepts, and rules of conduct. The original work is supposed to have been destroyed, either during the invasion of Persia by Alexander the Great or immediately after the conquest of the country by the Arabs. The books have since been re-collated and revised. There is an edition of the text by Geldner (1886-94), an Eng. trans. in *Sacred Books of the East* (vols. iv., xxiii., xxxi.), and a German trans. by Bartholomae (1905).

Zenica, or ZANITZA, tn., Bosnia - Austria, on the Bosnia, 35 m. N.W. of Sarajevo. Has coal and iron industries, and a trade in plums, grain, and hides. Pop. (1910) 7,196.

Zenith, the point of the celestial sphere vertically above the spectator. Zenith distance, which is complementary to altitude, is the angular space between the zenith and a celestial object. Sir George Airy invented a reflex zenith tube, chiefly for observing the Greenwich zenith star, γ Draconis, in which the image was viewed by reflection from a surface of mercury. The zenith telescope, devised by Talcott in 1834, is chiefly a geodetical instrument. It serves to determine geographical latitudes by Talcott's method, which depends upon measurements of the zenith distances of pairs of stars crossing the meridian north and south of the zenith. Designs for horizontal zenith telescopes, fed by plane mirrors inclined 45° to the horizon, were published by MM. Cornu and Lippmann in 1901-2.

Zenjan, tn., Persia, cap. of Khamseh prov., 175 m. w.n.w. of Teheran. It was formerly a stronghold of Babiism. Pop. 25,000.

Zenker, FRIEDRICH ALBERT VON (1825-98), German physician, a native of Dresden, became professor of pathological anatomy and general pathology at Dresden (1855) and at Erlangen (1862). He is celebrated as the discoverer of trichinosis at Dresden in 1860. He was the first to make known the degeneration of striated muscular fibre in typhus.

Zeno. (1.) Ancient Greek philosopher of the Eleatic school, was a native of Elea (Velia) in southern Italy, and a pupil of Parmenides. He was born about 490 B.C. At the age of forty he went to Athens, and is said to have taught Pericles and Callias. None of his philosophical writings remain. Aristotle calls him the father of dialectic or logic. He made use of famous paradoxes, such as that of Achilles and the tortoise, to prove that

motion is an illusion of the senses. (2.) ZENO (c. 360-270 B.C.), founder of the Stoic philosophy, was a native of Citium in Cyprus. He is said to have taken up his residence in Athens; opened a school in the porch, or rather colonnade, adorned by the paintings of Polygnotus—the *Stoa Poikilē*—whence his disciples were called Stoics. He was a friend of Antigonus Gonatas, king of Macedonia. None of his works are extant. His threefold division of philosophy into ethics, physics, and logic, and still more the practical application of philosophy to conduct, were the novelties of the Stoic teaching. It is difficult to distinguish the precepts of Zeno himself from the additions of his successors Cleanthes and Chrysippus; but he seems to have laid down the main principles of Stoicism. (See STOICISM.) (3.) Emperor of the Eastern empire at Constantinople from 474-91 A.D., was a native of Isauria. In 475-7 he was expelled by an insurrection. His reign was remarkable chiefly for wars with the Goths and the establishment of the Gothic kingdom of Italy under Theodoric. See also BYZANTINE EMPIRE.

Zeno, APOSTOLO (1668-1750), Italian poet and literary historian, was born at Venice. After founding the *Giornale de' Letterati d'Italia*, with Maffei and Vallisneri (1710 sq.), and preparing his edition of the Venetian historians (1718-22), he became till 1729 court poet and historiographer of the emperor Charles v. For him he wrote most of his sixty melodramas (1st ed. 1744; 2nd ed. 1795). These play an important part in the history of Italian opera, fixing the form of the melodrama for musical purposes. He wrote notes to Fontanini's *Bibliot. dell' Eloq. Ital.* (1750); biographies of Sabellico, Guarini, Davila, and the three

Aldi; and a supplement (1752-3) on Voss's work on the Latin historians. See Pistorelli's *I Melodrammi di A. Z.* (1894), and Menghi's *Lo Z. e la Critica Letteraria* (1901).

Zeno, NICCOLÒ (1340-91), Venetian explorer. Leaving Venice (1390), he was stranded on the 'island' of Friesland (i.e. Faroe Is.). Then, with his brother Antonio, he made various expeditions, on one of which they reached Greenland. Niccolò also sailed to Esthland (Shetlands) and Iceland, and died in Friesland. His brother Antonio (d. 1406), after his return from Greenland, spent fourteen years in Friesland, but died in Venice. An account of their voyages was published in 1558.

Zenobia, wife of Odenathus, prince—afterwards called king—of Palmyra (Tadmor in Syria); her native name was Bat Zabbai. Odenathus fought against the Persians on behalf of the emperor Gallienus. After his death, in 266 or 267, Zenobia ruled, and conquered Egypt. Then, aiming at complete independence of the Roman empire, she was defeated by Aurelian at Hemesa (272) and herself captured. Shortly afterwards Aurelian destroyed Palmyra, razing its walls. Zenobia was taken to Rome, but was allowed to live near Tivoli. See Stuart Jones's *Roman Empire* (1908), and John Kelman's *From Damascus to Palmyra* (1908).

Zenodotus (c. 325-234 B.C.) of Ephesus, was made the first librarian of the great library at Alexandria by Ptolemy Philadelphus. He classified the Greek epic and lyric poets, compiled a glossary of Homer, and was the first critical editor of the Homeric poems.

Zenta, tn., Bács-Bodrog co., Hungary, on r. bk. of Theiss, 33 m. by rail s. of Szegedin, was the scene of the defeat of the Turks

by Prince Eugene on Sept. 11, 1697. Pop. 30,000.

Zeolites, a group of minerals, which consist chiefly of hydrous silicates of aluminium, sodium, and calcium. They lose their combined water readily, some of them in dry air at ordinary temperatures (laumontite), others when warmed, and all give off water freely, and seem to boil when heated before the blow-pipe. They mostly occur well crystallized, and are secondary products of the decomposition of the felspars and feldspathoids of igneous rocks. Very fine specimens are obtained from veins and cavities in the basalts and similar rocks of Iceland, Faroe, W. Scotland, Bohemia, India, the Cape. Among the best known are analcite, laumontite, natrolite, stilbite, and chabazite. Their specific gravity is always low (about 2.2), their hardness usually from 3½ to 5.

Zephaniah, a Hebrew prophet, possibly the great-grandson of King Hezekiah, who lived and prophesied in Jerusalem in the reign of Josiah. His prophecy was probably uttered before 621 B.C., when the reformation of Jewish religion was carried out. He anticipates an overwhelming ruin from invaders, which is to be a world-judgment on all nations. See S. R. Driver's *Introduction to Old Testament Literature* (6th ed. 1897); A. B. Davidson's *Cambridge Bible* (1896); and Nowack's *Die Kleinen Propheten* (1899).

Zephyrus, in Greek mythology, the west wind, personified as a son of Astræus and Eos, and brother of Boræus, the north wind.

Zeppelin, FERDINAND, COUNT VON (1838), German aeronaut, born in Constance; became a lieutenant in the army before he was twenty-three; was on special observation duty with the Union army in the American civil war; distinguished himself in the

Franco-Prussian war; and retired as a general of cavalry in 1891. While in the army he became an enthusiastic student of aeronautics, and after his retirement devoted himself wholly to that science. In the summer of 1908, he made a number of remarkable flights with a dirigible airship built after his own plans. On Aug. 4-5 he undertook a 24-hour endurance test and reached Mayence, 261 m. from his starting point on Lake Constance. At Echterdingen, on his return, his machine was wrecked in a storm. A popular subscription was opened to enable him to continue his experiments, and from the receipts he retained sufficient to build another airship, and gave the remainder, £150,000, to found an institute for the promotion of aeronautics science. See BALLOON.

Zerafshan. (1.) River, Russian Central Asia, in West Turkestan, formerly a tributary of the Oxus. It rises in the Alai section of the Tian-shan, and flows generally W.N.W. past Samarkand; and then, describing a sort of curve around Bokhara city, is lost in the sands 58 m. N.E. of the Oxus. The length is about 470 m.; its basin-area 15,000 sq. m. (2.) See SAMARKAND.

Zerbst, walled tn., duchy of Anhalt, Germany, 22 m. S.E. of Magdeburg; has manufactures of beer, machinery, gold and silver articles, chemicals, and starch. Pop. (1910) 19,209.

Zermatt, vil. (5,315 ft. above sea-level) at foot of Monte Rosa and the Matterhorn, in the Swiss canton of Valais. It is one of the chief resorts of travellers in summer, and is 22 m. by rail from Visp (Viège) in the Rhone valley. Pop: 800.

Zero represents either the entire absence of the particular quantity in question, or else the point from which the quantity is measured.

Zetland. See SHETLAND.

Zeuglodonts, extinct fossil whales, represented by the single genus *Zeuglodon*, an animal which attained a length of over sixty feet, and is found in the Middle and Upper Eocene beds in England, N. America, France, Russia, and Egypt. It had a long narrow skull, with powerful jaws, which were provided with teeth, conical in front, but sharp-edged and adapted for cutting behind. The neck vertebrae were not fused together, the nasal bones were long; and these characters, together with the presence of two distinct kinds of teeth, show that they were more primitive than existing whales. The Zeuglodonts appear to have arisen from a Creodont ancestor in Egypt early in Eocene times. The ancestral forms discovered are *Protocetus* from the Mokattam hills, and *Prozeuglodon* from the Fayûm. See Catalogue of the 'Tertiary Vertebrata of the Fayûm, Egypt,' Brit. Mus. Nat. Hist., 1906.

Zeugma, a figure of speech, in which one verb or verbal expression is used with two objects, the second of which necessitates the understanding of a different verb—e.g. 'to burn the ships and the men'—i.e. 'to burn the ships and kill the men.' It is often used in Greek and Latin, and also in English, often with a comic effect, as in Dickens's 'She went home in a flood of tears and a sedan chair.'

Zeulenroda, tn., Germany, in the principality of Reuss-Greiz, 10 m. W. by S. of Greiz. It manufactures hosiery, textiles, soap, machinery, and furniture. Pop. (1910) 10,365.

Zeus. See JUPITER.

Zeuss, JOHANN KASPAR (1806-56), founder of Celtic philology, born at Vogtendorf in Bavaria; was appointed professor of philology at Bamberg (1847). His principal writings were *Die Deut-*

schen und die Nachbarstämme (1837), *Die Herkunft der Bayern von den Markomannen* (1839), and a work which secured for him world-wide reputation for scholarship—*Grammatica Celtica* (1853; 2nd ed. 1868-71).

Zeuxis (fl. 425-400 B.C.), Greek painter, was a native of Heraclea, on the Euxine. None of his works survive, but many stories testify to his marvellous power. Aristotle criticised his pictures as wanting in character—that is, in the expression of moral sentiments. His most famous picture was his *Aphrodite*; others were the *Infant Hercules Strangling the Serpents*, and *Zeus Enthroned*.

Zevenbergen, comm., Netherlands, in N. Brabant, 8 m. W.N.W. of Breda. Pop. (1910) 7,732.

Zevio, comm., Italy, on the Adige, in prov. of and 9 m. E.S.E. of Verona. Pop. 6,500.

Zeyla, or **ZAILA**, tn., British Somaliland, on Gulf of Aden, 145 m. S.W. of Aden, is a caravan centre for Abyssinia. Coffee, hides, mother of pearl, and gums are exported. Pop. averages about 5,000, but varies with the season.

Zeyst, or **ZEIST**, vil., Netherlands, prov. of and 5 m. E. by S. of Utrecht; has manufactures of soap and candles. It has been a seat of the Moravian Brethren since 1746. Pop. (1910) 12,806.

Zgierz, or **ZGERJ**, tn., Piotrkow gov., Russian Poland, 6 m. N.N.W. of Lodz, with textile industries. Pop. 19,000.

Zheleznovodsk, a spa in northern Caucasus, Russia, 11 m. N.N.W. of Pyatigorsk. The water is impregnated with iron.

Zhitomir. See **JITOMIR**.

Zhob, a riv. of N.E. Baluchistan giving name to a district in charge of a political agent. The district produces asbestos, chromite, and salt. Area, 9,620 sq. m.; pop. 70,000. The cap. is

Fort Sandeman. British authority was established in Zhob in 1889.

Ziani, Venetian family. **SEBASTIANO** (d. 1179), doge of Venice, was elected in 1172. He successfully reorganized the finances of Venice, and aided in the negotiations for peace between the pope and the emperor Frederick I., after the battle of Legnano. He renounced the dogeship (1178) and retired to a monastery. His son, **PIETRO**, elected doge in 1205, held the dignity for twenty-three years.

Zibet. See **CIVET**.

Zichy, **EUGEN**, COUNT (1837), Hungarian explorer, born at Zichy-falva, was elected deputy of the Hungarian Parliament (1861), as a supporter of Deák, and organized four expeditions into Central Asia and the Caucasus to trace the origin of the Hungarians. The results were published in a work in three volumes (1897).

Ziegenhals, tn., Silesia, Prussia, 34 m. S.W. of Oppeln. It manufactures textiles, gloves, and paper. Pop. (1910) 8,978.

Ziegler, **JAKOB MELCHIOR** (1801-83), Swiss geographer, born at Winterthur, was appointed lecturer in mathematics in his native town (1828-34). With his pupil Wurster he produced a large number of maps and atlases, notably *Atlas über alle Teile der Erde nach Karl Ritter's Lehre* (2nd ed. 1864); *Hypsometrischer Atlas* (1856); and a treatise, *Ueber das Verhältnis der Topographie zur Geologie* (1869-76). See Geilfuss's *Leben des Geographen J. M. Ziegler* (1884).

Zielenzig, tn., Brandenburg, Prussia, 25 m. E.N.E. of Frankfurt-on-the-Oder. It has woollen manufactures. Pop. (1910) 5,704.

Zierikzee, seapt., Netherlands, in prov. of Zeeland, on the isl. of Schouwen, near the E. Scheldt, 18 m. N.E. by E. of

Middelburg. It was formerly an important member of the Hanseatic League. Pop. (1910) 6,808.

Zieten, HANS JOACHIM VON (1699-1786), Prussian general, born at Wustrau, near Ruppin, served in the wars of Frederick the Great, distinguishing himself especially at Moldau-Tein (1744), and Hohenfriedeberg (1745); he took a leading part in the Seven Years' war, gaining renown at Prague (1757), Kolin, Leuthen (1757), Liegnitz (1760), and Torgau (1760). See *Winter's Life*, in German (1885).

Zifte, tn., Egypt, on the Damietta arm of the Nile, 60 m. S.S.W. of Damietta. Pop. 11,000.

Zilah, or ZILLENMARKT, tn. in Transylvania, Hungary, co. of Szilagy, 40 m. N.W. of Klausenburg. Pop. 7,600.

Zilleh, or ZILE, tn., Asia Minor, in vilayet of and 70 m. N.W. by w. of Sivas. It is on the site of the ancient *Zela*, on the acropolis of which was built a castle, the ruins of which still overlook the modern town. Pop. 20,000.

Zillerthal Group. See TYROL, ALPS OF.

Zimapan, tn., Hidalgo, Mexico, 90 m. N. by w. of Mexico city, in the centre of a mining region. Pop. 15,000.

Zimbabwe, GREAT, collection of ruins, S. Rhodesia, 17 m. S. of Victoria, and about 160 m. S. of Salisbury. Some of the walls are 35 ft. high, and in some places 16 ft. thick. According to one theory the buildings were erected by some Semitic race—possibly the Sabæans from S. Arabia—as a stronghold and as a place for smelting and purifying ores. According to another theory (Randall-MacIver's), they are contemporary with mediæval Europe, and are of African negro origin. They were rediscovered by Adam Renders in 1868. There are three distinct groups of ruins,

the 'Elliptical Temple,' the 'Acropolis,' and the 'Valley Ruins.' See Theodore Bent's *The Ruined Cities of Mashonaland* (3rd ed. 1895), D. Randall-MacIver's *Mediæval Rhodesia* (1906), and R. N. Hall's *Great Zimbabwe* (1905) and *Prehistoric Rhodesia* (1909).

Zimiscus. See BYZANTINE EMPIRE.

Zimme, Siam. See CHIENGMAI.

Zimmermann, ALBERT (1808-88), German painter, born at Zittau; is noted for his delineations of historical and mythological subjects, among his principal works, showing great breadth and dexterity in handling, being a *Combat of Centaurs*, *Mary Returning to the Cross*, and a *Flock Dispersed and the Shepherd Killed by a Mountain Hurricane*. He was professor of painting at Milan (1857) and at Vienna (1859-72).

Zimmermann, JOHANN GEORG, BARON VON (1728-95), Swiss physician and author, was born at Brugg, in canton Aargau. In 1768 he was appointed physician to the king of England at Hanover. In 1786 he attended Frederick the Great during his last illness. Later in life his state of mind was depressed almost to madness. His most famous book was *Ueber die Einsamkeit* (1755; better ed. 1784-5); he also wrote several books about Frederick the Great. See his own *Life*, in German, by Bodemann (1878).

Zimmermann, REINHARD SEBASTIAN (1815-93), German genre painter, born at Hagenau, on Lake Constance. He lived in Paris (1844-5) as a painter of portraits. Afterwards he visited England, and finally settled at Munich (1847). His principal works include the *Three Magi* (1850), *An Interrupted Game of Cards* (1869), and *Scene in a Village Inn* (1881). He wrote the

autobiographical *Erinnerungen eines alten Malers* (1884).

Zimmern, HELEN (1846), philosophical and critical writer, born in Hamburg, but came to England when quite a child, and lived there as a naturalized British subject until 1887, when she settled in Italy. Her principal works are *Lessing* (1878); *Schopenhauer* (1876); a translation of Firdausi, issued as *Epic of the Kings*, and *Tales from the Edda*, both in 1882; *Life of Maria Edgeworth* (1883); *Hansa Towns* (1889); and *Sir Laurence Alma Tadema* (1902).

Zinc, Zn, 65.4, a metallic element that does not occur free in nature. Its chief sources are blende, ZnS, and calamine, ZnCO₃, but it also occurs in red zinc ore, ZnO, and hemimorphite or electric calamine, H₂Zn₂SiO₅. The ore is first roasted with access of air to convert it to oxide, which is then heated with small coal to set free the metal, ZnO + C = CO + Zn. The reduction is carried out in tubular retorts in the Belgian process, or in Δ shaped muffles in the Silesian method, both kinds being mounted in sets in a gas-fired furnace. The product is refined by melting in a reverberating furnace, the lead present settling below the zinc. Further purification is effected by redistillation. Zinc, also known as spelter, is a bluish-white crystalline metal, that is brittle at ordinary temperatures, but becomes malleable between 100° and 200° C. Its specific gravity is 7.1; it melts at 419° C., boils at 925° C., and is a fair conductor of electricity. Zinc, when rolled into sheets, is used for roofing, as it is but slowly affected by the weather, whilst it is also largely employed to alloy with other metals—e.g. with copper it forms brass. It is also much used for coating or 'galvanizing' iron to keep it

from rusting, the iron being very thoroughly cleaned and immersed in a bath of molten zinc. When heated in air, zinc burns with a greenish flame, forming white woolly flakes of the oxide ZnO. This oxide is of basic character, and from it, as from the metal itself, the salts of zinc can be obtained by solution in acids. Thus zinc sulphate, or white vitriol, is obtained when the oxide or metal is dissolved in dilute sulphuric acid. The process is commonly employed in the latter case to prepare hydrogen, Zn + H₂SO₄ = ZnSO₄ + H₂. Zinc sulphate is prepared also by roasting sulphide ores, and crystallizes from water in colourless rhombic prisms of the formula ZnSO₄·7H₂O. It has a metallic taste, and acts as an astringent, being used on this account in the treatment of sores and ulcers. Internally it acts as a rapid emetic, and is thus employed in cases of poisoning. Zinc chloride is obtained by dissolving the oxide, metal, or carbonate, in hydrochloric acid, the solution on evaporation yielding a white soft deliquescent mass, with caustic properties, and acting as an irritant poison. It is employed in the solid form as a caustic, and in solution, under the name of Burnett's disinfecting fluid, as an antiseptic; it is also used as a flux in soldering, and for weighting cotton goods. Zinc is used largely for the negative poles of primary batteries, both wet and dry. It is the most electro-negative of the common metals.

Zincography. See PROCESS WORK.

Zinder, a dist. of the French Military Territory of the Niger. The chief town is Zinder, 135 m. N. by E. of Kano (N. Nigeria). It is surrounded by earthen walls, and has a large trade in cotton, ostrich feathers, salt, silk, and spices. Pop. 15,000.

Zingel (*Aspro zingel*), a small perch found in the Danube.

Zingiber, a genus of tropical herbaceous plants belonging to the order Scitamineae. They bear spike-like thyrses of flowers, and several species are grown as stove or greenhouse plants. The rhizomes of *Z. officinalis* constitute the ginger of commerce.

Zinnia, a genus of half-hardy Mexican plants belonging to the order Compositae. They bear heterogamous, radiate flower-heads, often brilliantly coloured, the ray florets being ligulate, and the disc florets tubular. The annual species are much grown in English gardens. Seed is sown over heat in April, and the young plants, having first been planted out in a frame, are planted out of doors about the second week in June. Most of the garden zinnias are varieties of *Z. elegans*.

Zinzendorf und Pottendorf, NICOLAUS LUDWIG, COUNT VON (1700-60), restorer of the church of the Moravian Brethren, was born at Dresden. In 1722 he founded the Moravian colony of Herrnhut in Saxony. Exiled by the government of Saxony (1736), he travelled in Europe and America on behalf of his church, making many converts, till (1742) Frederick II. granted the Moravians religious liberty. See *Lives* by Varnhagen von Ense (1860) and Spangenberg (1772-5).

Zion. See JERUSALEM, and JEWS, HISTORY OF.

Zion City. See DOWIE, JOHN ALEXANDER.

Zionist Movement. See JEWS, HISTORY OF.

Zipaquirá, tn., Colombia, 40 m. N. of Bogotá, with iron and coal mines. Its salt mines are a profitable government monopoly. Pop. 12,000.

Zircon, a mineral consisting of silicate of zirconium. It has a hardness of 7½, a specific gravity of 4.7, and forms semitranslu-

cent, tetragonal crystals of varying colour. It is found in Ceylon, Norway, and the Urals. The colourless or finely coloured crystals are used as gems, the red under the name of jacinth, and the greenish as jargon, whilst opaque varieties form the source of zirconium.

Zirconium (Zr, 90.6), a rare element, occurring in Ceylon and other places as a silicate, $ZrSiO_4$, in zircon or hyacinth. It is prepared by displacement by aluminium or sodium from its fluorine-potassium compound, and forms silvery gray scales or a black amorphous powder. The zirconium salts are derived from the feebly basic zirconium hydroxide $Zr(OH)_4$. Zirconium oxide has been used as a component of incandescent gas mantles, and as a substitute for lime in the lime-light, whilst the coloured varieties of the naturally occurring silicate are used as gems.

Zirndorf, tn., Bavaria, Germany, in Middle Franconia, 5 m. W. by S. of Nuremberg. Pop. (1910) 5,619.

Ziska, or ZIZKA VON TROCNOW, JOHANN (1360-1424), Bohemian religious leader; saw military service against the Turks, and fought at Agincourt (1415) on the side of the English. In July 1419 he headed a popular movement in Prague against the Roman Catholics. After that he formed an army of extremists from amongst the Protestant Hussites, and in October 1419 seized a hill overlooking Prague; but it was not till 1420 that the city revolted from the emperor Sigismund. The fortification of Mount Tabor in Bohemia gave Ziska a stronghold for the revolution, and in 1421 Sigismund was driven from Bohemia. A German army that came against the Hussites was put to flight from Saaz, and in 1422 Sigismund was routed at Kuttenberg. In

1423 Ziska attacked the more moderate section (the Calixtines) of his own party, spreading fire and slaughter as far as Moravia and Hungary. See *Life* by Tomek (Ger. trans. 1882).

Zither, a stringed instrument, which is thought to be of ancient Asiatic or Greek origin. It consists of a flat, shallow, oblong, wooden box, over the sounding-board of which the strings, resting on a bridge, are stretched. Concert instruments contain a fretted finger-board, and the melody strings over this are sounded by a metal plectrum on the right thumb of the player, the other strings being plucked by the fingers.

Zittau, tn., Bautzen dist., Saxony, on the Mandau, 25 m. by rail S.E. of Bautzen; has manufactures of damask and woollen goods. Lignite is mined. There is a fine town hall. Pop. (1910) 37,084.

Zittel, KARL ALFRED VON (1839-1904), German geologist, was born near Freiburg in Baden, and became an assistant at the Mineralogical Institute, Vienna. He was made professor of mineralogy at Karlsruhe (1863), and of geology at Munich (1866). In 1873-4 he took part in Rohlfs's expedition to the Libyan desert. He was also president of the Bavarian Academy of Science. His principal works are *Handbuch der Paläontologie* (1876-90); a treatise on geology and palaeontology, entitled *Aus der Urzeit* (1875); and *Beiträge zur Geologie und Paläontologie der Libyschen Wüste* (1883). See Rothpletz's *Gedächtnisrede auf K. A. von Zittel* (1905).

Zizel, or SUSLIK (*Spermophilus*), a genus allied to the squirrels, whose American representatives are called gophers.

Zizkow, tn., Austria, in Bohemia, an E. suburb of Prague. Pop. (1911) 72,195.

Zlatoust, tn., Ufa gov., E. Russia, 147 m. E.N.E. of Ufa city, with a cathedral and arsenal; also iron foundries and manufacture of weapons. Gold and iron are mined. Here is an important magnetic and meteorological observatory. Pop. 22,000.

Zloczow, tn., Galicia, Austria, 40 m. E. by s. of Lemberg. It has a mediæval castle. Pop. (1911) 13,212.

Znaim, tn., Austria, in Moravia, 45 m. N.N.W. of Vienna. The site of the former castle of the margraves of Moravia is now occupied by a brewery. Vegetables are grown, especially pickling cucumbers. Pottery is the chief industry. Here was concluded the armistice of 1809 between Austria and France, which led a few days later to the peace of Vienna. Pop. (1911) 18,828.

Zoan. See TANIS.

Zoar. (1.) The Bela of Gen. 14:2, 8, one of the 'five cities of the plain' (Gen. 19), at the base of the hills of Moab, in the plain of Shittim, Palestine, is now represented by a ruined mound. (2.) Village, Tuscarawas co., Ohio, U.S.A., on the Tuscarawas, 100 m. by rail s. of Cleveland; was till 1898 the seat of a German communistic society (Separatists). Pop. (1910) 182.

Zodiac, a belt of the sky extending 8° on each side of the ecliptic, and comprising the apparent paths of the sun, moon, and principal planets. It is divided into twelve signs of 30° each, the names and symbols of which are—Aries, ♈; Taurus, ♉; Gemini, ♊; Cancer, ♋; Leo, ♌; Virgo, ♍; Libra, ♎; Scorpio, ♏; Sagittarius, ♐; Capricornus, ♑; Aquarius, ♒; Pisces, ♓. The first six are north of the equator, the last six south of it. The six 'ascending' signs are those from Capricornus to Gemini inclusive, in which the sun is moving north-

ward; the six 'descending' signs, those in traversing which he continually increases his north polar distance. The series begins with the vernal equinox, and shifts through precession. The zodiac is of immemorial antiquity. It was invented in Babylonia, essentially as we know it, not later, and probably much earlier, than 2000 B.C. The Greeks adopted it about the 6th century B.C., and transmitted it westward. The Chinese Kung, which can be traced back to the 7th century B.C., included the twelve signs—Tiger, Hare, Dragon, Serpent, Horse, Ram, Ape, Cock, Dog, Boar, Rat, and Ox. They were superseded, three centuries ago, under the tutelage of Jesuit missionaries, by the European zodiac. The Mexican zodiac was divided into twenty signs. Our zodiacal symbols came into use about the 10th century A.D. The lunar zodiac, widely diffused throughout the East, included twenty-seven or twenty-eight sections, representing the moon's daily motion. In India they were intimately connected with the Vedic ritual.

Zodiacal Light, so called from its situation in the zodiac. It is a cone of faint luminosity, visible after sunset near the vernal equinox, and before sunrise, six months later, extending from the place of the sun over an arc of about 80°. Brightest at the horizon, it is there from 20° to 30° broad, and tapers upward to a blunt apex. It appears to be a solar appendage of a lenticular shape, occupying sensibly the same level—if Dr. Wolf's photographic indications be reliable—with the solar equator (*Sitzungsberichte*, Munich, xxx., 197), and reaching out beyond the earth's orbit. Barnard finds that it extends 65° north and south of the sun. It is generally thought to be composed of cosmic

particles revolving independently round the sun, and reflecting his light. An alternative view is, that the 'false dawn' (as it was called in Persia) represents an extension of the coronal equatorial electric streamers. It has been successfully photographed by Mr. A. E. Douglass at the Lowell Observatory in Arizona. The related phenomena of the 'zodiacal band' and the *Gegenschein* remain enigmatical. The former is a narrow ribbon of dim light connecting the opposite summits of the cone, so as to complete the circuit of the zodiac. The *Gegenschein*, noticed by Pézénas in 1730, but effectively observed by Brorsen in the middle of the 19th century, is a diffuse, roundish glow, situated diametrically opposite to the sun. Gyllén and F. R. Moulton (*Celestial Dynamics*) sought to explain it as possibly an assemblage of oscillating satellites of the earth.

Zoe (c. 978–1050), Byzantine empress, was the daughter of Constantine VIII. She was accessory to the murder of her first husband, the emperor Romanus (1034), after which she married and raised to the throne Michael IV. After his death (1041), she married (1042) Constantine IX.

Zoea. See CRAB.

Zoetrope, or THAUMATROPE, a scientific toy, in which, by the combination of a series of pictures, each representing the same figure but in a different position, a continuous and moving representation of the figure is given. It consists of a cylinder, closed at one end, and inside of it a strip containing the pictures is wound. The cylinder is rapidly revolved, and on looking through slits placed at the top, and equal in number to the number of pictures, the necessary optical illusion is produced.

Zoffany, JOHANN (1735–1810), German painter, was born at

Ratisbon; spent several years in Rome from 1748, and came to England (1758). He painted Garrick in many of his famous impersonations, and portraits of a large number of royalties and noble personages.

Zohar, or SOHAR. See CABBALA.

Zola, EMILE EDOUARD CHARLES ANTOINE (1840-1902), French novelist, born in Paris. He began early to write, his first book being *Contes à Ninon* (1864), which had some measure of success, as also had his critical papers on literature and art in *L'Événement*, edited by Villemessant. The powerful but repulsive novel, *Thérèse Raquin*, which appeared in 1867, strengthened his reputation, as did the *Chronicles of the Rougon-Macquart Family*. This first series was entirely eclipsed by the enormous popularity which attended his next novels. In 1877 *L'Assommoir* appeared—a novel depicting, in realistic but lurid colours, the awful consequences of the craving for drink. Then came *Nana* (1880), and then a second series of the *Rougon-Macquart Chronicles*, up to *Le Docteur Pascal* (1893). These fictional annals rival Balzac's *Comédie Humaine* in patient analysis of character and vivid interest. Zola also attacked the problem of miracle-working in *Lourdes*, of the Romish Church as a means of popular reformation in *Rome*, of the inner life of the masses in *Paris*, of population in *Fécondité*, of labour and its agencies in *Travail*. He was also the author of several plays. He took a very prominent part in the rehabilitation of Captain Dreyfus. Having convinced himself that the captain was innocent, he attacked the army and all those opposed to Dreyfus in a denunciatory letter in the *Aurore* (1898), in which he openly challenged legal consequences. These ensued, and

though Zola ultimately won, he found it prudent to seek temporary refuge in London. Zola was found dead in his bedroom in Paris, having been asphyxiated by the fumes of a charcoal stove. He was more than once a candidate for a seat in the French Academy, but was never successful. In 1908 his remains, which had lain for six years in Montmartre cemetery, were exhumed, and re-interred with impressive ceremony in the Panthéon. See E. A. Vizetelly's *Emile Zola* (1904).

Zolkiew, tn., Galicia, Austria, 16 m. N. of Lemberg; has an old castle, once the residence of John Sobieski, king of Poland. Pop. (1911) 9,463.

Zolliker, GEORG JOACHIM (1730-88), Swiss Protestant preacher, born at St. Gall; was a clergyman at Murten in Vaud; became pastor of the Calvinistic community at Leipzig (1752), and was the foremost preacher of his age. His *Sermons Completés* was published in 1789-1804. See Garve's *Ueber den Character Zollikofers* (1788).

Zöllner, JOHANN KARL FRIEDRICH (1834-82), German astronomer, born at Berlin, and appointed professor of astronomy at Leipzig (1866). His principal writings include *Ueber die Natur der Kometen* (1871), *Grundzüge der Allgemeinen Photometrie des Himmels* (1861), and *Photometrische Untersuchungen* (1865). He gave considerable attention to spectrum analysis, observation of the sun, and spiritualism.

Zollverein, a German word meaning customs union. It first came into use as the name for the commercial arrangements set up (1833) between Prussia, Hesse-Kassel, Hesse-Darmstadt, Bavaria, and Würtemberg, in virtue of which these states (1) adopted a common tariff, and (2) abandoned all duties which had hither-

to be levied on goods imported from the other contracting states. This was followed by several arrangements between the various states of Germany, all intended to further the same end, which was at length effectively attained by the union of the German empire in 1871. Similar commercial arrangements have been made between large and small states—e.g. San Marino and Italy (1862), Monaco and France (1865), Portuguese India and British India (1878). After the Boer war of 1899-1902 a South African customs union was formed. See Fisk's *International Commercial Policies* (1907).

Zolochew, tn., Russia, in gov. of and 23 m. N.N.W. of Kharkov. Pop. 7,000.

Zolyom-Brezo, or BREZOVA, vil., Hungary, co. Neutra, 56 m. S.E. of Brünn. Pop. 6,000.

Zomba, tn., cap. of the Nyasaland (formerly the British Central Africa) Protectorate, 10 m. west of Lake Shirwa, on the lower slopes of Zomba Mountain, 3,000 ft. above sea-level. Has a pop. of about 80 whites.

Zombor, royal free city, cap. of co. Bacs-Bodrog, Hungary, 58 m. S.W. of Szegedin, and just N. of the Franz Josef canal, connecting the Danube and the Theiss; manufactures flour, and trades in grain and cattle. Pop. 30,000.

Zone, in astronomy, a section of the sphere intercepted between two parallels of declination. Star catalogues on an extensive scale are frequently constructed in zones. Bessel's zones extended from dec. - 15° to + 45°, and embraced 64,000 stars; Argelander's reached from - 31° to + 80°, and yielded 40,000 stars; Gould observed 73,160 stars in zones between - 23° and - 80°. The *Cape Photographic Durchmusterung* is arranged in zones 1° wide; and the same plan has been adopted

for the international astrographic catalogue now in course of publication, as well as in the corresponding chart of the heavens.

Zone System, ON RAILWAYS. A system somewhat prevalent on the Continent especially, but also to a small extent in Great Britain and Ireland, whereby a railway ticket is available over a certain radius from a centre, as a season ticket, for one journey within the zone on the lines of a particular railway or railways. The fares increase according to the zones: thus in Zone A the fare to any station, whether 30 or 50 miles from the starting-point, would be the same; whilst to any station in, say, Zone B the fares, whether 51 or 70 miles distant, would also be the same. By this method long-distance passengers travel at the expense of short-journey travellers. The prices charged for such privileges are small, and the advantages to tourists very considerable.

Zongolica, tn., Mexico, in state of and 65 m. W.S.W. of Vera Cruz. Pop. 7,000.

Zooantharia, the name of the order which includes the sea-anemones and their allies.

Zoö - Geography. See GEOGRAPHICAL DISTRIBUTION.

Zoogloea. See BACTERIOLOGY.

Zooid, a term applied to the products of vegetative multiplication—for example, in the Hydrozoa, where each polype in a sea-fir colony is a zooid. Zooid is also sometimes applied to the units in a Polyzoon colony.

Zoological Society, of London, was founded in 1826 and incorporated in 1829. It has its headquarters in Regent's Park at the gardens of the society, and meets regularly between November and June, for the reading of papers on zoological topics. The *Proceedings* of the society are published four times a year. The society's collections of living ani-

mals is lodged in the Zoological Gardens (the 'Zoo') in Regent's Park. The gardens were started in 1828, and cover 30½ acres; they are open to the public on week days throughout the year, but on Sundays are reserved for fellows and their friends. See H. Scherren's *The Zoological Society of London* (1905), and the society's *Annual Report*.

Zoology is the scientific study of animal life as distinguished from biology, which covers the study of plant life as well. See BIOLOGY, and the articles on the several species of animals.

Zoophyte, a name sometimes given to certain of the Coelentera, notably to the sea-firs and their allies, from the apparent resemblance to a plant.

Zoospore, a mobile spore or swarm spore, produced by many algae and fungi. See SPORE.

Zöpfel, RICHARD OTTO (1843-91), German theologian, born at Arensburg in Livonia; was first a teacher of theology at Göttingen, but afterwards removed (1872) to Strassburg, where he was appointed professor of theology (1877). He wrote two excellent works, *Die Papstwahlen* (1871), and *Johannes Sturm* (1887), and collaborated with H. J. Holtzmann in an edition of the popular *Lexikon für Theologie und Kirchengewesen* (3rd ed. 1895).

Zoppot, seaside resort, Prussia, in prov. of W. Prussia, 7 m. N.N.W. of Danzig. Pop. (1910) 15,033.

Zor, a prov. of Turkish Syria, on both sides of the middle Euphrates, Area, 30,110 sq. m. Pop. 100,000. The chief town is Deir.

Zorndorf, vil., Brandenburg prov., Prussia, 5 m. N.N.E. of Küstrin, was the scene of the defeat of the Russians by Frederick the Great on Aug. 25, 1758.

Zoroaster, or ZARATHUSHTRA, founder of the religion of the Parsees and of ancient Persia, was

of princely descent, but little that is authentic is known of his life. He is supposed to have commenced his ministry at the age of thirty, and preached a pure monotheism and an ideal morality. His teaching was pre-eminently one of persuasion; and apparently he made no effort to obtain proselytes, or in any way to interfere with those of other creeds. Zoroaster is supposed to have been murdered, in his 75th year, at Bactria. See further under ZOROASTRIANISM.

Zoroastrianism, the religion of the ancient Persians, preached by Zoroaster, was established at least 800 years B.C. It was a protest against polytheism, idolatry, and the licentiousness of the age. Its monotheism is thus expressed: 'There is only one God, and no other is to be compared to Him; a Creator without form, invisible, mighty, just, merciful, and worthy of adoration—the Elohim or Jehovah of the Old Testament. The teaching of the creed is conveyed in the simple declaration, 'Perform good actions, and refrain from evil ones.' Zoroaster recognized, as all revivalists have done, the existence of two powerful agencies—the creative and the destructive, the good and the evil; the soul in conflict with the body, the spirit warring against the flesh. Fire and light were taken to represent the beneficent agent, charred wood and darkness the evil. He made no attempt, however, to reconcile man's liberty with God's providence, man's suffering with God's rectitude; but declared that everything was for the best for every individual. The Bible of the faith is *Zend-Avesta*; but a more modern and more popular code of morals is contained in the *Revelations of Arda Viraf*. The descriptions of heaven and of hell contained in this book may aptly be

compared to the visions of Isaiah and St. John, and to the *Inferno* of Dante. The strongly-marked characteristics of the faith are hospitality, philanthropy, and benevolence. Zoroastrianism has no active missionary agency; its founder seems to have been concerned with the reclamation of his countrymen, and to have treated other forms of faith with a large-hearted tolerance. This creed was professed by the ancient Persians from the end of the 6th century B.C., but lost influence after the downfall of the Achæmenian dynasty in 331 B.C. It was again made supreme by the Sasanian dynasty (227-636 A.D.), until supplanted by Mohammedanism. The modern adherents are the Parsees. See Windischmann's *Zoroastrische Studien* (1863), Tiele's *Geschichte der Religion im Altertum* (1898), Jackson's *Zoroaster, the Prophet of Ancient Iran* (1899), and books quoted under ZEND-AVESTA.

Zorrilla y Moral, JOSE (1817-93), Spanish poet and dramatist, a wayward genius, whom political persecution kept poor and in frequent exile. Though his work is often hasty and loose, his patriotic choice of themes and his real gifts have kept him from oblivion. His narrative-historical poems, *Leyenda de Alhama* and *Leyenda del Cid*, are less popular than they were; but his dramas keep firm hold on Spain by their strength and fervour, especially *Don Juan Tenorio* and *El Zapatero y el Rey*. His *Don Juan* has been represented more than once on the English stage. See Zorrilla's autobiography, *Recuerdos del Tiempo Viejo* (1894).

Zorzi, BERTOLOME (c. 1230-c. 1290), Italian poet who wrote in Provençal. He was imprisoned by the Genoese from 1266 to 1273, during the war between Venice and Genoa. While in captivity he wrote several inter-

esting *sirventes*—one in defence of Venice (in answer to Calvo), another on the death of Conradin (1268), and a third in support of the crusade of 1270. These, together with some moral and love poems, were edited by E. Levy in a masterly monograph (1883).

Zosimus (fl. 425 A.D.), Greek historian. His history traces the decline of the Roman power from the establishment of the empire by Augustus to 410 A.D. It is mainly an abridgment of previous works; but the paganism of the author leads him to attack the Christian emperors. Edition by Mendelssohn (1887).

Zouaves, originally Kabyle soldiers of the French army, recruited (1830) in Algeria at the time of the taking of Algiers. At first French and Kabyle soldiers were enrolled in the same regiments and the same company; afterwards in the same regiment, but in different companies; and from 1840 the Zouaves were entirely Frenchmen, who wore a semi-Moorish uniform. The Kabyles fought in the Franco-German war of 1870 as 'Turcos'. The name of 'Papal Zouaves' was also given to the household troops of the Pope on duty at the Vatican.

Zoutpansberg, mt. range, a detached portion of the Drakensberg, S. Africa, stretches E. and W. south of the Limpopo R., in the Transvaal prov. The great salt pan at its W. extremity gives name to the mountains and to a magisterial district in the N.E. of the Transvaal, with an area of 25,650 sq. m. and a pop. of about 320,000. Gold and copper are mined in the district, whose chief towns are Leydsdorp and Pietersburg.

Zrinyi, NIKLAS, COUNT VON (1508-66), Hungarian general, who distinguished himself in the wars with the Turks. He ably defended Croatia, of which he was ban (governor), from 1542,

and his exploits have been made the subject of drama. In 1566, with 3,000 troops, he held the town of Sziget against Solymán the Magnificent, who besieged it with more than 50,000 men, and fell fighting to the last.

Zschokke, JOHANN HEINRICH DANIEL (1771-1848), German man of letters, was born at Magdeburg. He had a chequered early life, and was for a while a strolling player. Then he lectured at Frankfurt, and wrote for the theatres. After 1800 he filled various public offices in the republic and in the canton of Aargau. In 1798 he wrote his *Geschichte des Freistaats der drei Bünde in Rhätien*, and concerned himself with Swiss politics. Amongst his works are histories—Switzerland (1822) and Bavaria (1813-18)—and many tales, collected as *Bilder aus der Schweiz* (1824-5), *Ausgewählten Novellen und Dichtungen* (ed. 1874), and *Ahrenlese* (1844-7). But his most popular book was the religious *Stunden der Andacht* (1809-16). See his autobiographical *Selbstschau* (1842), and *Life*, in German, by Born (1885).

Zschoppau, tn., Saxony, Germany, on riv. of same name, 8 m. s.e. of Chemnitz; manufactures textiles, etc. Pop. (1910) 6,730.

Zuccaro, FEDERIGO (1543-1609), Italian painter, was born in Tuscany; was assistant of his brother Taddeo (1529-66), who was engaged at the Vatican. Then he was employed in decorative painting at Florence and Venice, and was called to Rome in 1566 to complete Taddeo's work in the Vatican. On account of a quarrel he fled to France, and in 1574 came to England. There he painted a number of portraits, including Queen Elizabeth's and Leicester's, but after a six years' stay returned to Italy. After a visit to Spain, where he painted frescoes for the Escorial, he

founded at Rome the Academy of St. Luke.

Zuffenhausen, vil., Württemberg, Germany, 3 m. N. of Stuttgart. Pop. (1910) 12,752.

Zug. (1.) Swiss canton, the smallest in area (92 sq. m.), and the smallest but one in population, mainly German-speaking and Roman Catholics. It became a canton in 1352, and sends one representative to the National Council. Pop. (1910) 28,013. (2.) Town, cap. of the above canton, is a quaint little town at the N.E. corner of the Lake of Zug (9 m. long, 15 sq. m. in area), 14 m. S. of Zürich. Pop. (1910) 8,038.

Zuider Zee ('Southern Sea'), a gulf of the Netherlands, separated from the North Sea by the chain of islands, Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog, and communicating with it by the Marsdiep, the Eijerland Gat, and the Vlie Strom, is 85 m. from N. to S., and 45 m. in greatest breadth, and covers an area of 2,027 sq. m. It is very shallow, the average depth being from 10 ft. to 19 ft.; but the action of the wind makes it necessary to protect the shores, particularly in the S., by dikes. Formerly a lake (Flevo), surrounded by fens and marshes, the Zuider Zee acquired its present dimensions through inundations in the 12th to the 15th century—the most disastrous taking place in the 13th century. Reclamation schemes have been discussed by the Dutch government, and in 1900 a bill was introduced, but afterwards withdrawn, to reclaim, first some 115,000 acres of the southern part, at a cost of £7,917,000, and eventually 500,000 acres, at an estimated additional cost of £24,000,000. See the Report issued in 1901 by the British Foreign Office, *Draining the Zuiderzee*.

Zukertort, JOHANN HERMANN (1842-88), chess master, was born

in the province of Riga, and served with the medical corps in the Austro-Prussian and Franco-German wars; and after the close of the latter took up the career of chess master, having been a pupil of Anderssen, whom in 1871 he defeated. He came to England, and was naturalized in 1872. He beat Blackburne (1881), Rosenthal (1880), and achieved his ambition of beating Steinitz in 1883, at the great London tournament of that year. Steinitz, however, defeated him in America in 1885. Play exhausted his nervous energy, and eventually he broke down under the strain.

Zula, vil. in the Italian colony of Eritrea, on Annesley Bay, on the w. side of the Red Sea, 30 m. s.s.e. of Massowah. It occupies the site of the ancient *Adulis*. Zula was used as the base of operations by the British during the Abyssinian war in 1868.

Zulia, a N.W. state of Venezuela surrounding Lake Maracaibo. Area, 26,000 sq. m. Pop. 90,000. Cap. Maracaibo.

Zülchow, vil., Pomerania, Prussia, immediately N. of Stettin. Pop. (1910) 8,010.

Züllichau, tn., Prussia, in Brandenburg, 50 m. e.s.e. of Frankfort-on-the-Oder; it manufactures textiles. Pop. (1910) 8,035.

Zululand, a territory in N.E. of Natal, S. Africa, separated from it by the Tugela R., after being administered as a protectorate (along with Amatongaland) from 1887, was in December 1897 incorporated with Natal. Including Amatongaland and the Ingwavuma district, it covers an area of 10,450 sq. m., and has a population of 235,000, the white population numbering about 1,700. St. Lucia Lagoon and Bay give it communication with the sea. Gold, coal, iron, and copper occur. Sugar, maize, millet, coffee, tea, and tobacco are cultivated. Large

numbers of cattle and sheep are reared. From Durban a railway runs N.N.E. to the St. Lucia coal-fields (168 m.). Its coast lands are unhealthy, but the interior affords some of the finest pasture land in S. Africa. See Rosamund Southey's *Storm and Sunshine in South Africa* (1910); Dr. G. M'Call Theal's *History of South Africa since 1795* (1908); and works under NATAL.

Zulus, or AMA-ZULUS, a Bantu people of S.E. Africa, whose original domain lay between the Tugela R. and Lake St. Lucia, but early in the 19th century was extended by conquest over Natal, the late Boer states, Southern Rhodesia, and Gazaland, and at some points even beyond the Zambezi to Nyasaland and Lake Tanganyika. With the kindred Ama-Xosas, commonly called Kaffirs, they form the Zulu-Kaffir division of the southern Bantu family. Zulus, Xosas, Galekas, Gaikas, Tembos, and all the other Kaffirs, are essentially one people, with common physical and mental characters, speech, religion, usages, and traditions. The Zulus are so named from a legendary chief Zulu, ancestor of Dingiswayo, founder of the Zulu state, about the close of the 18th century. The ruthless military system introduced by him was further developed by his successor, Chaka, during whose reign (1800-28) the Zulu power was firmly established, and the Zulu name became a terror to all the surrounding peoples. The system was first shaken by collision with the Boer pioneers in 1834-8, when Chaka's successor, Dingaan, was overthrown in Natal, and his great captain, Umsilikatze, driven from Transvaal across the Limpopo to Matabililand. But it still persisted till finally suppressed by the English, who in 1879 defeated and deposed Cetywayo, last of Dingiswayo's dynasty, and

in 1893 overthrew Umsilikatze's successor Lobengula. With the capture and deposition of the Zulu chief Gungunyana by the Portuguese in Gazaland (1896), the last remnant of the Zulu military power was extinguished. In 1906 there was a revival of Zulu unrest in Natal, which had to be put down by armed force. See Colenso's *Extracts from the Blue Books*, etc. (1880); Frances Colenso's *The Ruin of Zululand* (1884); R. N. Cust's *The Modern Languages of Africa* (1883); J. Y. Gibson's *Story of the Zulus* (new ed. 1911); A. H. Keane's *Africa*, vol. ii. (2nd ed. 1904); and Captain W. Bosman's *The Natal Rebellion of 1906* (1907).

Zumala-Carrégu, TOMAS (1789-1835), Spanish general in the cause of Don Carlos. He was born at Ormaiztegui, and fought under Mina against Napoleon's invasion of Spain, and under Quesada (1820). Having in 1832 been dismissed from the army as a Carlist, he in 1833 headed the Carlist insurrection. He gained some victories, but was mortally wounded at the siege of Bilbao.

Zumpt, AUGUST (1815-77), German philologist, was born at Königsberg, nephew of Karl Zumpt. He became (1851) a lecturer on Latin epigraphy at Berlin. His researches into Roman antiquities have been of much use to scholars. His principal works include *Monumentum Ancyranum* (1845; and supplement, 1869); *Commentationes Epigraphicae* (1850-4); and *Studia Romana* (1859).

Zumpt, KARL GOTTLÖB (1792-1849), German philologist, was born at Berlin. After teaching at the Joachimsthal academy (1821-6), he was appointed professor of Roman literature in the University of Berlin (1827). In 1835 he was elected a member of the Royal Academy of Sciences of Berlin. His principal claim

to notice is his *Latin Grammar* (Eng. trans. 1823), the chief feature of which is its syntax, a work remarkable for its thoroughness. See *Life*, in Latin, by A. W. Zumpt (1851).

Zungaria, or DZUNGARIA, a region of both the Chinese and Russian empires, between the Central Tian-Shan and the W. Altai; with an area of 148,000 sq. m., and a population of 600,000 (estimated). On the w. side, Chinese Zungaria is intersected by the Ek-tag Altai, Tarbagatai, and Ala-tau ranges, between which open three great depressions connecting the Aral-Caspian basin with the Mongolian lowlands. These are (1) the Irtish and Urungu valleys; (2) the valleys of the Sassik-kul, Ala-kul, Ebinor, and other lakes forming the 'Zungarian strait'; (3) the valley of Chuguchak. Chinese Zungaria again has three principal physical regions--(1) the low-lying steppes and lakes, to w. and n.; (2) valleys and arable plateau land of medium elevation, mostly in the central region; (3) mountains to e. and s. The Mohammedan inhabitants are generally known as Dungans or Tungans.

Zungeru, the centre of administration of N. Nigeria Protectorate, W. Africa, about 80 m. up the Kaduna R. (a tributary of the Niger), in 9° 49' N. lat. and 6° 9' E. long., about 430 m. by rail N.N.E. of Lagos. From Zungeru the railway has been extended to Minna in the Gwari country, where a junction is effected with the main line of the Baro-Kano railway. A tramway of 2 ft. 6 in. gauge and 22 m. long connects Zungeru with Barijuko, the highest navigable point of the riv. Kaduna.

Zuñiga. See ERCILLA Y ZUÑIGA.

Zunz, LEOPOLD (1794-1886), Jewish scholar, born at Detmold

in Germany, was (1839-50) principal of the Jewish college at Berlin. His principal works are *Die Gottesdienstlichen Vorträge der Juden* (1832); *Die Synagogale Poesie des Mittelalters* (1855); *Die Ritus des Synagogalen Gottesdienstes* (1859); and *Literaturgeschichte der Synagogalen Poesie* (1865).

Zurbaran, FRANCISCO (1598-1662), Spanish painter, born in Estremadura; was appointed court painter to Philip IV., and, from the similarity of his style to that of the Italian painter, he has been called the Spanish Caravaggio. His most famous work is an altar-piece, the subject being St. Thomas Aquinas, which he executed for the church of the College of St. Thomas Aquinas at Seville.

Zürich. (1.) Swiss canton, ranks officially as the first in the confederation, which it entered in 1351 as its fifth member. Its area is 665 sq. m. (including 21 sq. m. of Lake Zürich), and its population (inferior only to that of Bern) is (1910) 500,679, mainly German-speaking and very largely Protestant. It is the industrial and manufacturing region of Switzerland. (2.) The most populous and most important town in Switzerland, cap. of the above canton, is built on the Limmat as it issues from the Lake of Zürich (34 sq. m. in area, and 25 m. in length), and of recent years has vastly increased in size and splendour. The fine Romanesque Grossmünster church dates from the 11th century. Zwingli, the reformer, was its pastor from 1519 till his death in 1531. The town library contains 170,000 volumes, and is the largest in Switzerland. The Swiss National Museum was opened here in 1898. The handsome Polytechnic (1861-4) is the seat of the University of Zürich (which was founded in 1832, and had 1,408 students in 1910-11) and

of the Federal Polytechnic School (which was opened in 1855, and had 1,336 matriculated students in 1909). The observatory is situated in 47° 22' 40" N. lat. and 8° 33' 7" E. long. Zürich is the centre of the Swiss silk manufacture, while cottons and machinery are also made. Pop. (1910) 189,088. See *Festschrift zur Feier des 50-jährigen Bestehens des Eidgenössischen Polytechnicums* (1905).

Zurita, JERONIMO (1512-80), Spanish historian, born at Saragossa. He was (1547) the official historiographer of Aragon, and one of the first of the modern historians of Spain, seeking his material from official sources and confining himself to a narrative of a limited and recent period. His principal work is *Anales de la Corona de Aragon* (6 vols. 1562-79), ending with the death of Ferdinand the Catholic. He also wrote a corrected edition of the *Chronicles of Castile* of Pedro Lopez de Ayala.

Zutphen, tn., Netherlands, prov. Gelderland, 17 m. N.E. of Arnhem, on the IJssel. It has a very interesting church and houses of 16th and 17th centuries. Its manufactures include paper, leather, and oil. Under its walls Sir Philip Sidney was killed in 1586. Pop. (1910) 18,313.

Zuyder Zee. See ZUIDER ZEE.

Zvenigorodka, tn., Kiev gov., S.W. Russia, 91 m. S.S.E. of Kiev; manufactures tobacco and candles. Pop. 17,000.

Zweibrücken (Fr. *Deux-Ponts*; Lat. *Bipontinum*), tn., 48 m. N.W. of Strassburg; was the cap. of a duchy of same name, now included in the Rhine Palatinate, Bavaria. Machinery, leather, cigars, furniture, soap, and cotton goods are manufactured. Pop. (1910) 15,251.

Zweihonnschaften, vil., Rhenish Prussia, 4 m. S.S.W. of

Essen, on the Ruhr. Pop. (1910) 6,960.

Zwickau. (1.) Town, kingdom of Saxony, prov. Zwickau, picturesquely situated on l. bk. of the Mulde, 20 m. w.s.w. of Chemnitz. Chemicals, glass, earthenware, automobiles, wire goods, and machinery are manufactured. Coal is mined. The church of St. Mary dates from 1451. Schumann (1810-56), the musical composer, was born here. Pop. (1910) 73,152. (2.) Town, Bohemia, Austria, 18 m. w. of Reichenberg; has textile industries. Pop. (1911) 5,731.

Zwijndrecht, comm., Netherlands, in S. Holland, on the Old Maas, 2 m. w.n.w. of Dordrecht. Pop. (1910) 7,074.

Zwingli, HULDREICH, or UL-RICH (1484-1531), Swiss reformer, born at Wildhaus, in the canton of St. Gall, and studied at the University of Vienna, under the humanist Conrad Celtis. In 1502 he went to Basel, where he taught for a time. In 1506 he was called to be pastor of Glarus, and more than once accompanied his parishioners to the wars in Italy as their chaplain. Meantime his studies (in Greek and Hebrew) of the Holy Scriptures, and the influence of Wyttenbach, led him to serious doubts regarding certain doctrines of the church; and these were confirmed by a study of the fathers, and by the influence of Erasmus. During his stay of ten years at Glarus, he made two discoveries which materially affected his future career—one that it had been the custom in the early Swiss Church that immediately after baptism the sacrament of the eucharist should be administered to the child, and that the various mass books did not agree. This, to his mind, was sufficient to disprove the claim of the Church of Rome that her liturgy had been the same in all ages. From Glarus

he went to Einsiedeln, then as now the most famous place of pilgrimage in Switzerland and Southern Germany. There Zwingli preached more freely than he had been able to do at Glarus, declaring that the Scriptures were the only safe rule in matters of faith. At the same time he publicly denied the right of the pope to decide in religious questions, and offered a bitter opposition to the sale of indulgences. In December 1519 he was appointed pastor of the cathedral church of Zürich, and there he laboured for the remainder of his life, his influence being powerfully exerted upon the side of the reformed doctrines. In January 1523, at a great council held in the town hall at Zürich, the city council gave an emphatic and official approval of Zwingli's doctrines, and requested all preachers in the canton to present them. In 1531 war was declared by the five papal cantons—Lucerne, Zug, Schwyz, Uri, and Unterwalden—instigated by Rome against the two reformed cantons, Zürich and Bern. The latter were totally defeated, many of the reformers being slain; among whom was Zwingli. Luther and Zwingli differed widely on the subject of the character of the Lord's Supper; but modern theology has pronounced in favour of the Zwinglian view, rather than Luther's. The contention between the two reformers produced a division in Protestantism, splitting the continental supporters of the reformation into Lutherans and the Reformed Church. See *Lives* by Myconius (1532), Schuler (1819), Hottinger (1841), Hoff (1882); and, in English, by Macauley Jackson (1901) and Simpson (1903). Zwingli's *Works* were published in 4 vols. (1545), also in 8 vols. (1828-42). A volume of *Selections* was issued by Macauley Jackson (1904).

Zwittau, tn., Moravia, Austria, near Bohemian frontier, 40 m. by rail N. of Brunn; has manufactures of cotton and linen. Pop. (1911) 9,651.

Zwolle, tn., Netherlands, cap. of prov. Overijssel, near r. bk. of Ijssel, 38 m. N.E. of Utrecht, is an important canal centre. It possesses buildings of from 15th to 17th centuries. Its industries include iron works, boat-building, tanning, and cotton and salt manufactures. Thomas à Kempis, author of *De Imitatione Christi*, spent near here the last sixty-four years of his life (1407-71). Pop. (1910) 34,055.

Zygophyllaceæ, a natural order of trees, shrubs, and herbaceous plants of wide distribution in the warmer extra-tropical parts of the world. Among the genera are *Zygophyllum* and *Guaiaacum*.

Zygophyllum, a genus of shrubs and herbaceous plants

belonging to the order Zygophyllaceæ. They bear yellow, red, or white flowers, followed by capsular fruit. A few species are grown in greenhouses, a peaty loam being the desirable compost. Among the best is *Z. Fabago*, the Syrian bean-caper, with copper-coloured flowers in autumn.

Zygostates, a genus of Brazilian, epiphytal orchids, bearing racemes of small flowers, and thick, fleshy leaves. *Z. greeniana*, which bears white flowers, with green-striped lips, is sometimes cultivated as a stove plant.

Zymotic, a term, introduced in 1842 by Dr. Farr, to denote the poison and pathological processes of epidemic, endemic, and contagious diseases. The use of the word is now most commonly restricted to the acute specific fevers, such as scarlatina and smallpox.

